Periodical
TECHNOLOGY DEPARTMENT

First Copy

August
1931

Construction Methods

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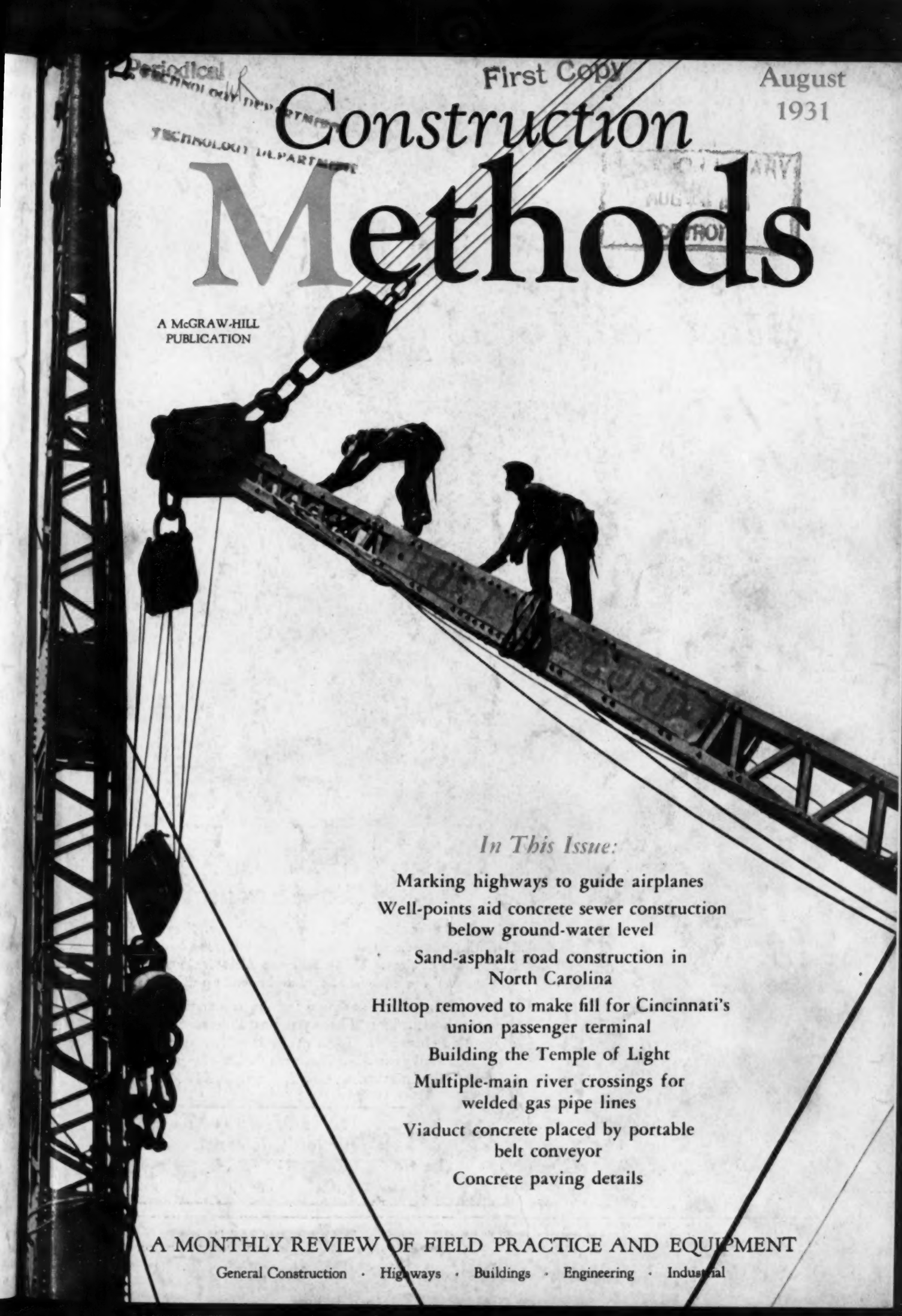

In This Issue:

Marking highways to guide airplanes

Well-points aid concrete sewer construction below ground-water level

Sand-asphalt road construction in North Carolina

Hilltop removed to make fill for Cincinnati's union passenger terminal

Building the Temple of Light

Multiple-main river crossings for welded gas pipe lines

Viaduct concrete placed by portable belt conveyor

Concrete paving details

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT

General Construction · Highways · Buildings · Engineering · Industrial

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There's an Allis-Chalmers Tractor of the right type and size for every need: Monarch "75," "50" and "35" Track-Type Tractors, Model "U" Wheel and Track-Type Tractors and Power Units.

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A full load every trip. Quick on the get-away. Speedy on the run. Over the dump in high. Fast on the turns. And back for another load ahead of time. That's how the Allis-Chalmers "35's" keep wagons at the grader or shovel and speed up dirt moving.

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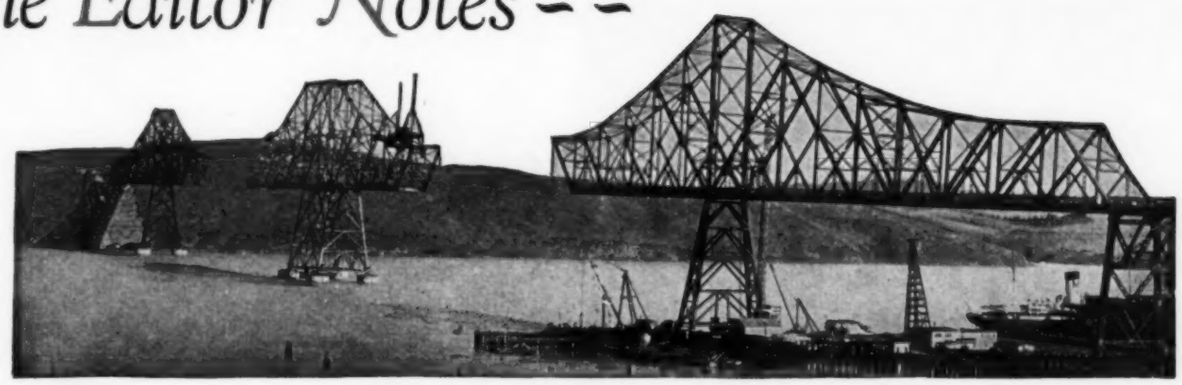
A DEMONSTRATION
on your job will convince you

CONSTRUCTION METHODS, August, 1931. Vol. 13, No. 8. Published monthly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at Thirty-sixth Street, New York, N. Y. $1 per year; 10 cents per copy. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 19, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

TECHNOLOGY DEPT.

The Editor Notes - -



New Leadership for Cement Industry

NEW leadership for the cement industry will begin Sept. 1, when E. J. Mehren, former editor of *Engineering News-Record* and vice-president of the McGraw-Hill Publishing Co., assumes the presidency of the Portland Cement Association. The significance of the appointment lies in its departure from precedent. For the first time the association's executive head has been chosen from without, instead of from within, the ranks of the cement producers. The move clearly implies recognition of a broader conception of the industry's relationship not only to the cement user, but also to the public at large The action is in line with present trends in industry toward more effective cooperative effort.

To his new post Mr. Mehren brings a background of valuable experience. As editor of the country's leading journal of civil engineering and construction, he has had a long and intimate contact with both the makers and the users of cement. His later and broader executive responsibilities in the business publication field have added an understanding of the conditions and problems of many industries.

Endowed with vision, energy, the ability to think clearly and to express himself fluently and forcefully, Mr. Mehren brings to the cement industry an influence that should prove to be of the highest value.

Ready-Mixed Concrete Shows Increase

Ready-mixed concrete with a production last year of more than 7,000,000 cu.yd. has come to stay as a method of construction, according to a report by R. Keith Compton, chairman of the central and truck mixed concrete committee, of the American Road Builders' Association. The report states that the most practical solution of the plant problem lies in the development of a swivel type conveyor to place the product where it is needed on the grade. The development of such equipment will overcome the present difficulty encountered where mesh reinforcing is used, make possible the reshaping of the subgrade behind the hauling equipment and eliminate the possibility of non-uniform density which may be caused by the concrete being dumped in a pile and pulled into place by hand labor.

Where no mesh reinforcing is used, the report suggests that light steel channels be used for truck runways. These channels should be in sections preferably 5 ft. in length. Where reinforcing mesh is used, portable swivel type conveyors to take care of at least 20 ft. of subgrade could be utilized.

In permitting the use of ready-mixed concrete engineers should, at all times, satisfy themselves that the operator is sufficiently equipped both from the standpoint of personnel and mechanical equipment.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD
J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, *Publishing Director*

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Tenth Avenue at 36th Street, New York

Identification Marks for Welds

For purposes of identification and with a view to encouraging the welder to take pride in his work, it is becoming common practice to provide each welder with a steel stencil with which he marks or autographs each weld with his own number. Inspectors checking completed welds are thus aided in fixing responsibility for good or poor work.

Highway Marking for Air Traffic

ENLARGED responsibilities for state highway departments are foreshadowed by the illustrated description of Ohio's pavement markings for air traffic on page 29 of this issue. Before the days of the automobile, simple sign posts at cross-roads were the main guides to traffic. After motor vehicles began to use the highways in ever increasing numbers the need for a far more complete system of directional and warning signs became apparent. The highway departments, therefore, had to expand the scope of their road building and maintenance operations to include an entirely new service, in order to facilitate the use of the highways for which the public was paying millions each year.

Now that traffic through the air is assuming sizable proportions, the cooperation of the highway departments is being sought in guiding airplanes to their destinations. In Ohio, this service to air traffic has been inaugurated by painting air markers on pavement surfaces in letters 12 ft. high. These markers consist of names of principal cities, directional arrows and mileages. Our newest form of transportation, therefore, promises to place new obligations on our highway departments and, incidentally, to open up new markets for the employment of labor, equipment and materials.

Welding Costs Lowered

Following several years of experience in steel construction by electric welding, the Austin Co., Cleveland, engineers and builders, announce that for the first time in building history their cost for this type of construction is now below that of the older riveted type. Increasing demand for noiseless building, as well as the volume of such building, has stimulated research, with the result that costs have dropped.

The Engineer Cooperates

NOT long ago an engineer on the staff of a state highway department asked *Construction Methods* for the names of manufacturers of certain equipment to be used on a job under his direction. He explained his purpose as follows:

> "All of our contractors for this class of work have bid low and some of them, at least, do not know how they are going to handle this part of it. We should like to help them find some kind of power equipment suitable for the work"

This engineer is serving his state well. He knows that a job that costs the contractor too much may also be costly to the state. He is giving the contractor constructive cooperation at the time it counts most—when he is planning his equipment and job organization.

Many engineers do this; they talk over with the contractor the most satisfactory methods and equipment to use. Some engineers specify minimum equipment requirements, others require a particular machine for a given purpose.

Because of this, *Construction Methods* numbers amongst its readers many engineers; not alone those who direct work in the field but those designers also who are alert to the influence that construction conditions may have upon their plans. Every factor that affects field construction operations is represented in its large and interested readership.

Willard Chevalier

Publishing Director

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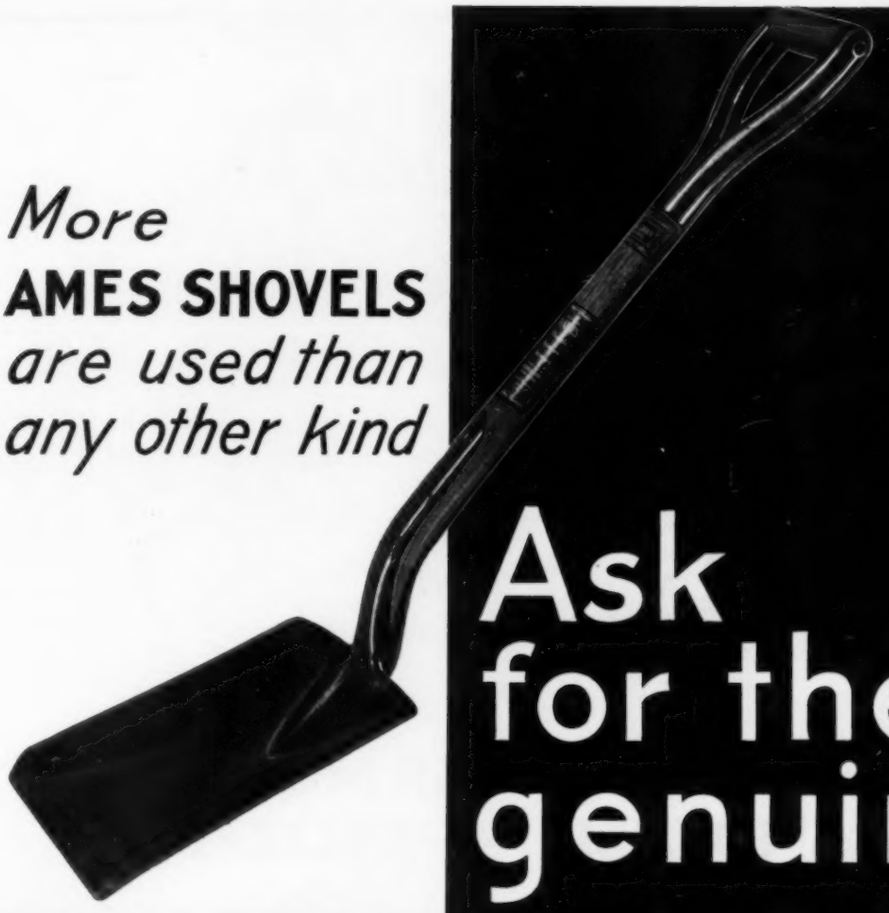
More
AMES SHOVELS
are used than any other kind



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4780

This Model N Autocar, owned by A. Daddario of Mattapan, Mass., is laying a mile and one-half of 48-inch sewer pipe through a swamp. The 3-yard dump body with St. Paul Hoist and the Mead-Morrison crane are operated by power take-offs. Complete specifications of this Model, which is made in four wheelbase lengths, may be had by writing The Autocar Company, Ardmore, Pa.

A STANDARD AUTOCAR MODEL SOLVES ANOTHER SPECIALIZED CONTRACTING PROBLEM . . .

Part of the right of way of the new Boston-Worcester highway had to be built through a swamp. Draining and filling had to be done before the concrete could be laid. To drain off standing water, it was necessary to lay a mile and one-half of 48-inch concrete sewer pipe. Each unit of pipe weighed 3,000 pounds.

The contract for the sewer work was awarded to A. Daddario, of Mattapan, Massachusetts. He started the job loading, hauling and setting pipe with skids and husky men. It was too slow. He consulted the Boston Branch of The Autocar Company. In the Autocar line he found, as so many motor truck users have done, exactly the right truck for this specialized work.

The Model N chassis, with its powerful Autocar Blue Streak 6-cylinder engine, the Autocar double reduction rear axle and its precision-built construction throughout, proved to be the right truck for this particular work.

AUTOCAR TRUCKS

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THE AUTOCAR COMPANY, *Ardmore, Pa.*

Contractors will find in the Autocar line of motor trucks and tractors, many standard models, highly specialized for the problems peculiar to their type of work. It is specialized equipment—Autocar equipment—that cuts costs and increases profits. Buy precision-built Autocar trucks.

THE CLOSE-QUARTER INDEPENDENT CROWD

Independent Crowd

with 25% more digging power *at the* dipper lip

A COMBINATION that is exclusively Northwest—the ability to dig with all the power of the engine at the dipper lip and give independent reach out beyond the boom without the hoist cable pulling back against the crowd.

The Close-Quarter Independent Crowd handles 25% harder digging and materially speeds spotting the dipper.

Here are features every shovel man has wanted. Ask for complete information. There is no obligation.

Northwest Engineering Co.
The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines
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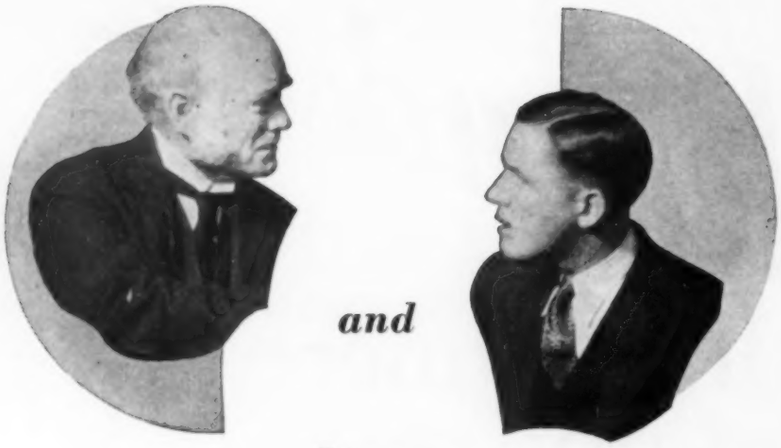
Chicago, Ill., U. S. A.

CM8-Gray

HANDLE HARDER DIGGING

NORTHWEST



and

discuss

STRONGER WELDS

"I'm convinced that if we can outweld all welders on strength of welds and toot our horn about such super-strength, it will prove a leadership story for us."

"That's easy in all cases except where we run up against people using Lincoln's 'Shielded Arc' processes, the 'Electronic Tornado' (automatic) and 'Fleetweld' (manual)."

"Well, can't we use some process that has the edge over them—even if it's only a little bit?"

"No, I've been hot on the trail of every new trend in arc welding and here are some figures on comparative tensile tests, each made in a different shop."

"SHIELDED ARC" WELDS	UNSHIELDED ARC WELDS
(a) 65,600 lbs. per square in.	42,700
(b) 67,300	44,300
(c) 69,100	48,500
(d) 72,000	55,400
(e) 75,100	56,100

"Yes, but have you figures on the costs —on the ductility?"

"Not on that test; but if you would like such figures there are rafts of them in a book of comparative tests giving figures, photos and facts of 'Shielded Arc's' lower cost, greater ductility and greater strength; get a copy by writing to

LINCOLN

THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

Largest Manufacturers of Arc Welding Equipment in the World

W-180

With over

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have said what they think of Bucyrus-Erie excavators. Investigate the low cost yardage ability of Bucyrus-Erie for your work.

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5/8
3/4
7/8
1
1-1/4
1-1/2
1-3/4
2
2-1/4
2-1/2
3
3-1/2
4
4-1/2
5 and up to 16 yards

Shovels
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Tunnel Shovels
Dredges
Drag-line Buckets

Gaso-line
Diesel
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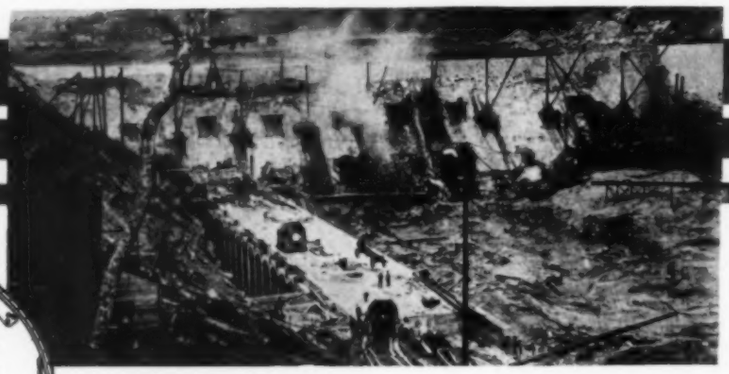
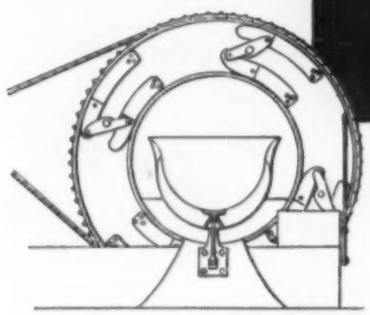
Electric
Steam
Diesel-Electric

Ransome — PIONEERS in BIG MIXERS

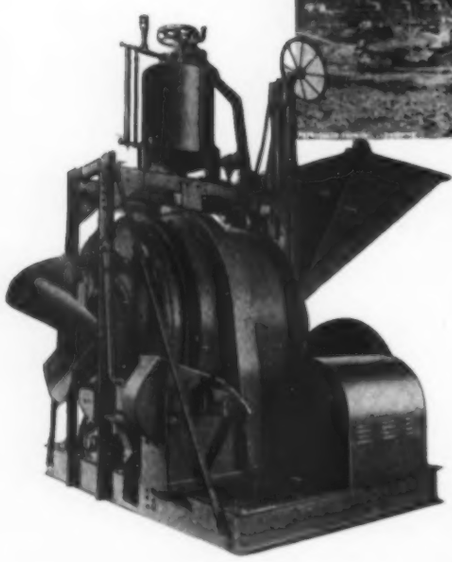


1902—Spier Falls Dam and Power Plant, Spier Falls, N. Y. Two #5 (2 yd.) Ransome Mixers used.



Cut of Ransome #5 Mixer

1930—Spier Falls Dam and Power Plant. Enlarged with the aid of two Ransome Big Mixers — 28-S.



A modern Ransome Big Mixer

Having pioneered the first concrete mixer in 1850, as far back as 1902, Ransome sensed the vital need for mixers of *giant* size and capacity.

Among the first jobs on which Ransome Big Mixers were used, was the Spier Falls Dam and Power Plant at Spier Falls, N. Y. in 1902.

In 1930, when the New York Power & Light Corporation enlarged this same project, two Ransome 28-S Standard Building Mixers were used by the Allied Engineers, Inc.

Ransome Big Mixers have performed satisfactorily over a period of twenty-nine years on important construction jobs and—in recent years—the repeat orders received from operators of Central Mixing Plants have proven the value of Ransome Big Mixers in this field.

WRITE FOR BULLETINS DESCRIBING RANSOME BIG MIXERS

Ransome Concrete Machinery Company

1850—Service for 81 Years—1931

Dunellen **New Jersey**

Portable Electric Tools

Speed Up the Job!

Use Them to Save Time and Labor

The World-Famous ½-Inch Electric Drill

Designed and built for hard, constant use, the Black & Decker ½-Inch Portable Electric Drill has long been the most widely used electric drill in the world.

Readily portable, weighing only 12½ pounds, yet so powerful that a man cannot stall it—even when drilling in steel at its maximum capacity. Universal Motor. Other drills in sizes from ¼-inch to 1½-inch, with hole saws and other accessories available to extend their usefulness.

Portable Electric Saws do the Work of Six Men

These safe, easily-handled saws will rip six times as fast as hand sawing and crosscut seven times as fast. Ideal for all types of building work, large construction jobs, repair work, etc.

Table adjustable from 0° to 45° for bevel cutting and other special sawing operations. With proper blade will also cut light metal, slate, marble, asbestos, tile, transite and porcelain. Universal Motor. Built in 6-inch, 8-inch and 10-inch sizes, packed in convenient carrying cases.

Drive Screws with Portable Electric Screw Drivers

Powerful Ball-Bearing Electric Tools for driving screws and nuts. Similar in construction to Black & Decker Electric Drills, except that spindle is provided with a positive clutch which releases screw when forward pressure on tool is relieved.

Ideal for driving any wood screws up to No. 16 by 3¼-inch long in hardwood, lag screws up to ⅜-inch by 4-inch long and nuts or bolts up to ¾-inch diameter. Universal Motors. Made in two convenient sizes.

The BLACK & DECKER 1⅛-INCH ELECTRIC HAMMER Quickly Pays for Itself!

IT STRIKES 2900 hard blows per minute continuously . . . and a man can strike only about 50 . . . think of the difference!

That's why this amazingly efficient electric hammer is indispensable for any "hammer-action" job such as driving star drills, steel chisels and wood-working chisels. Drills 1-inch holes in concrete at rate of 3 inches per minute—in brick, 8 inches per minute! Ideal for heavy mortising, bushing, caulking, demolition work, corner chiseling, etc.

Fitted with powerful Universal Motor, operating on A. C. or D. C. and Self-Cooling Barrel. Packed in Fibre Carrying Case. Available in ⅝-inch, 1⅛-inch and 1½-inch capacity sizes.

See them at your Distributor's today.

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TOWSON, MARYLAND, U. S. A. CM

Please send me catalogue showing full line of Electric Tools. I am particularly interested in:

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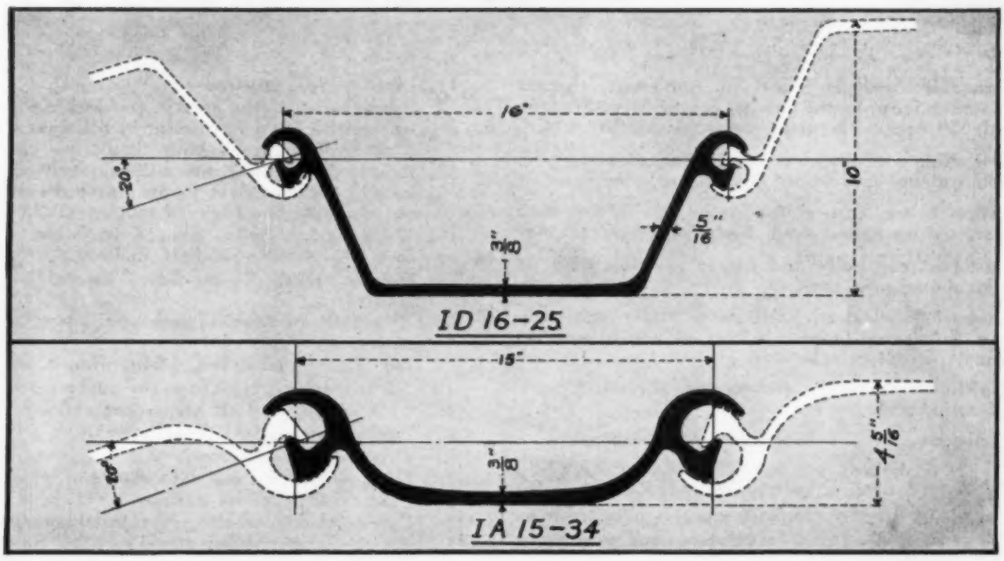
Now Producing
STEEL SHEET PILING



Section	IA 15-34	ID 16-25
Weight per foot	42.50 Lbs.	33.32 Lbs.
Weight per Square Foot of Wall	34.00 Lbs.	25.00 Lbs.
Moment of Inertia	19.10 In.^{4}	49.60 In.^{4}
Section Modulus	8.42 In.^{3}	13.44 In.^{3}
Section Modulus per Lineal Foot of Wall	6.74 In.^{3}	10.08 In.^{3}
Radius of Gyration	1.23 In.	2.25 In.

INLAND is pleased to announce Inland Steel Sheet Piling. The addition of this product is in accordance with the policy of constantly broadening the range of Inland products and Inland service to meet more completely the needs of steel users.

The two sections, ID 16-25 and IA 15-34, shown in the accompanying diagrams, are now being produced. Other sections will follow so that, in the near future, the line of Inland Steel Sheet Piling will be complete.

In keeping with Inland standards of quality, exhaustive tests have been made which indicate that in strength and driving qualities the Inland sections are unsurpassed.

Already, Inland Steel Sheet Piling has been used with complete success. Buyers may be assured that this new product will be manufactured with the same painstaking thoroughness that has typified all Inland products for nearly four decades.

Inland would welcome the opportunity of conferring with you regarding your requirements of steel sheet piling. INLAND STEEL COMPANY, 38 S. Dearborn Street, Chicago, Ill.

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ABLE SERVANT OF THE CENTRAL WEST

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Track Accessories Rails Rivets Billets Piling

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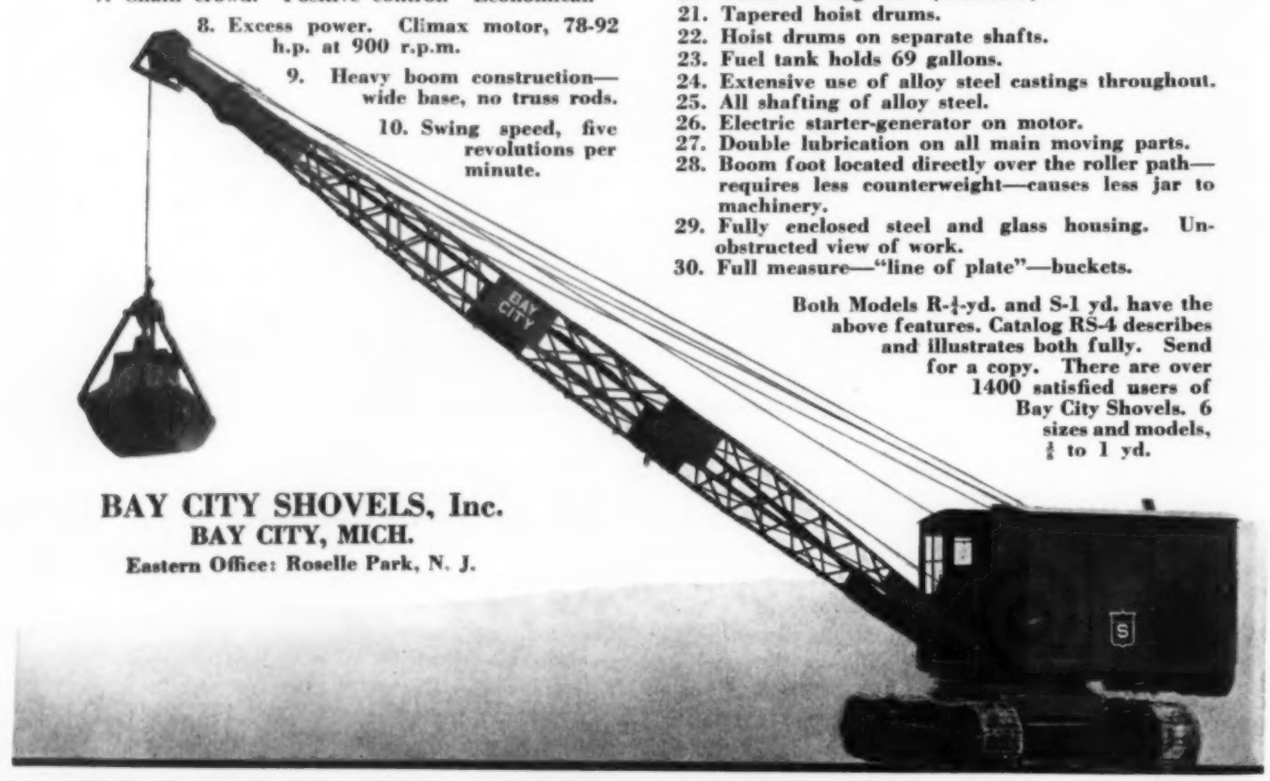
1. Unusually compact ¾ or 1 yd. convertible shovel. Distance from boom base to center of rotation is only 30 inches, assuring unusual stability.
2. New design of crawler steering mechanism permits quicker and easier steering or turning.
3. Large heavy cast roller path 76 in. in dia., mounted on unit cast car body, prevents rocking.
4. Unit cast car body and upper rotating base of high manganese steel.
5. Ease of lubrication. All parts under revolving base lubricated from a battery of grease connections conveniently located.
6. Eight-inch diameter center pin, threaded, with adjusting nut.
7. Chain crowd. Positive control. Economical.
8. Excess power. Climax motor, 78-92 h.p. at 900 r.p.m.
9. Heavy boom construction—wide base, no truss rods.
10. Swing speed, five revolutions per minute.
11. Line speeds unsurpassed.
12. Boom hoist of the safety, self-locking worm and worm wheel type, running in oil tight case, with Timken bearings taking thrust.
13. Heavy differential propelling mechanism (patented) permits steering in either direction without stopping the forward motion of the machine.
14. Hoist brake, 36-in. dia., 4 in. wide, providing ease of operation. Self locking.
15. Hoist clutches, 29-in. dia., 3 in. wide, with E-Z control.
16. All clutches external band type, powerful control, easily relined.
17. Large swing clutches, 18-in. dia., 4 in. wide.
18. Silent chain drive from the motor.
19. Ball bearings on all main shafts above car body.
20. Positive swing lock (exclusive).
21. Tapered hoist drums.
22. Hoist drums on separate shafts.
23. Fuel tank holds 69 gallons.
24. Extensive use of alloy steel castings throughout.
25. All shafting of alloy steel.
26. Electric starter-generator on motor.
27. Double lubrication on all main moving parts.
28. Boom foot located directly over the roller path—requires less counterweight—causes less jar to machinery.
29. Fully enclosed steel and glass housing. Unobstructed view of work.
30. Full measure—"line of plate"—buckets.

Both Models R-¾-yd. and S-1 yd. have the above features. Catalog RS-4 describes and illustrates both fully. Send for a copy. There are over 1400 satisfied users of Bay City Shovels. 6 sizes and models, ¾ to 1 yd.



BAY CITY SHOVELS, Inc.
BAY CITY, MICH.
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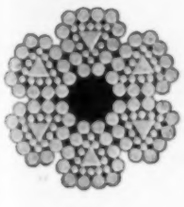
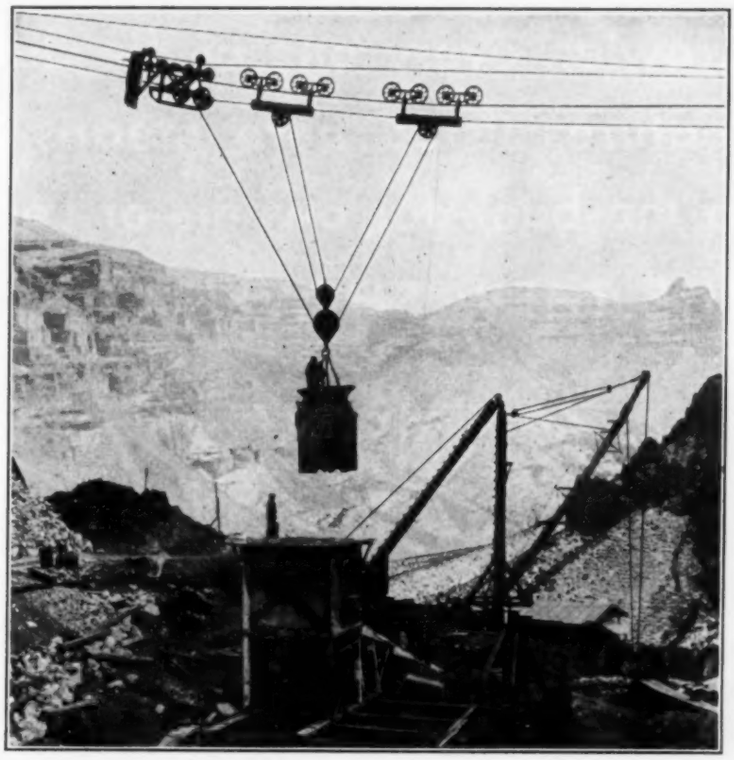
BAY-CITY SHOVELS

THE BAY-CITY FAMILY OF FAST WORKERS



"HERCULES" RED-STRAND WIRE ROPE

REG. U.S. PAT. OFF.



This is the 8 cu.yd. bucket that handles concrete on the Owyhee Dam. This structure will be 520 ft. high. The General Construction Co. of Seattle is the builder.

On the Owyhee Dam in Oregon

This is another big job on which "HERCULES" (Red-Strand) Wire Rope is the chief burden bearer—and individual burdens here run as high as twenty tons.

"HERCULES" (Red-Strand) Wire Rope is a dependable rope for hard work of all kinds because it is of uniformly high quality. It is made of acid open-hearth steel wire, and every wire used is first rigidly tested to make sure that it comes up to our exacting requirements.

—And the same qualities that enable this wire rope to save money on the big jobs also make it a money saver on all work where strength and endurance are prime factors. Why not write for further particulars?

Made Only by **A. Leschen & Sons Rope Co.** Established 1857

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New York Chicago Denver San Francisco

THE 2 Speed Center Drive Crawler gives Lorain machines a mounting that has become famous the world over for its low maintenance cost. ◆ Like the Center Drive Crawler, every one of the distinctive Lorain features listed here means more money in the bank for owners of Lorain machines.

THE THEW SHOVEL CO., Lorain, Ohio

AUTOMATIC DIPPER TRIP. Engine trips the dipper. Not necessary for operator to take hands off controls. Good for 10 truck loads more a day.

CENTER DRIVE SHOVEL BOOM. Loads your trucks on a higher bank. Digs and dumps higher up, digs deeper below the treads, reaches farther out than any other shovel of equal length boom and dipper stick.

Patented greenhorn on end of stick enables using every inch of its length.

SIMULTANEOUS OPERATION FOR CRANES. Hoists, swings, and travels (or derricks the boom) all at the same time.

PARTS SERVICE. At Lorain, 96% of telegraphic orders and 92% of all orders shipped within 24 hours. Local parts depot service throughout the United States.

All parts are machined and assembled to jigs, fixtures and templates to insure uniformity and easy interchangeability.

CENTER DRIVE FLEXIBILITY. One Powerful Motor with the flexibility of three. Power applied directly to 3 operations at one time, each independently controlled or concentrated to any one operation.

EXTENDED TRUCKS. One standard truck, variable in length, to suit ground conditions.

PRECISION 2 SPEED HOIST LINE CONTROL. High speed in hoisting crane loads. Low speed moves the load a fraction of an inch per second for precision placing.

EASY ON THE OPERATOR. Saves operator's muscle by making the engine engage the clutches.

Engine clutch control at operator's position. Saves steps and gas.

Automobile type pedals as comfortable as an old pair of shoes.

SIMPLIFIED CONTROLS. In the shovel: 3 levers, only 1 foot pedal. In the crane: 2 levers, 2 pedals. With only these controls to handle, operators can show real speed.

ORAIN 6 POINT CAB. All eel. New comfort and coolness, ew visibility, new convenience d safety. And it's the smartest oking of them all.

SPEED CENTER DRIVE RAWLER. Famous for low aintenance cost because of simlicity of moving parts.

speeds in either direction with qual efficiency. Double the power tio in low gear for tough going.

ropelling mechanism runs in a onstant oil bath.

through axles to carry the weight, ny one of which can do it alone.

o dead weight on any propelling shaft.

SHOCK ABSORBING AIRLEAD. Automatic straight ad from guide sheave to bucket. aves cables.

CONVERTIBLE UNITS. Shovel, crane, dragline, clamshell, skimmer-scoop, backdigger units are interchangeable. Lorain 75 turntables are transferable to 8-wheel locomotive car bodies.

THOROUGH INSPECTION. 89 tests and inspections of *each* machine.

AUTOMATIC CROWD BRAKE. Automatically holds the stick extended without attention from the operator.

GAS, DIESEL, ELECTRIC POWER. Without changes in the basic Center Drive design.

CENTER DRIVE CROWD. The power that propels a Lorain machine with all its tons of steel at 1½ miles per hour, can be concentrated directly to the crowd motion when the machine is digging.

SWING BRAKE. Quicker, more accurate swing control.

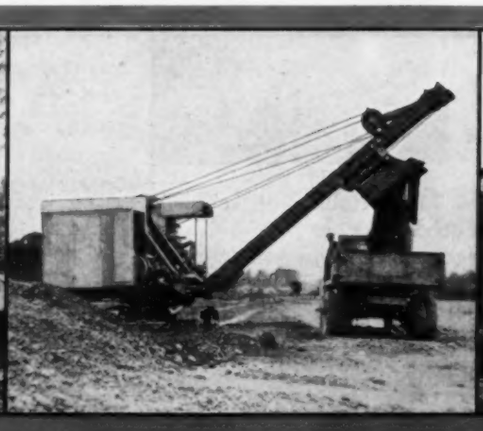
ALL STEEL CRANE BOOMS. 2 Sections, with intermediate middle sections—gooseneck top sections.

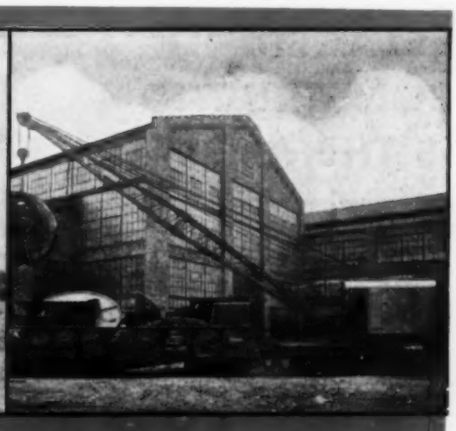
POSITIVE CHAIN CROWD. Made of special heat treated alloy steel. Self adjusting to all boom angles.

TIP AND TILT BACK-DIGGER DIPPER. Accurate control in digging and spotting the load. More than a trench-digger—an all round excavator.

INTERCHANGEABLE LAGGING. Flexibility that gives extra speed for easy digging—extra power for tough digging.

CENTER DRIVE SIMPLICITY. Fewer shafts and gears, fewer moving parts to wear.





THEW LORAIN 45-55-75

THEW CENTER DRIVE

RELAXED CONSTRUCTION IS THE ANSWER . .

Hold your hands together, as shown above, to the right. Note how naturally your forefingers lie against each other.

This illustrates Tru-Lay Preformed Wire Rope construction. The strands lie in position naturally—and relaxed. Internal stress, one of the most destructive agents in wire rope, is removed.

■

Now cross your fingers as shown at the left. This illustrates ordinary wire rope construction. Note the pressure and friction when you move these fingers. Note also the strain in the muscles of your hand, which illustrates the internal stress and cause for fatigue in ordinary wire rope.

■

Facts speak for themselves. Preforming is not a theory. It is a proved principle. Hundreds of our customers report increased service with Tru-Lay Preformed Wire Rope ranging from 30% to 300%, depending on the character of the equipment and the nature of the service. At the right is a report received from one of our customers. 100% increased service (just double) is being obtained with Tru-Lay Preformed Wire Rope. What would a similar saving mean to you?

Write today for complete information.

PREFORMED WIRE ROPE

TRADE **TRU-LAY** MARK

(REG. U.S. PAT. OFF.)

100%

INCREASED SERVICE WITH TRU-LAY

Compare an average of 12 eight-hour shifts with Tru-Lay Preformed Wire Rope —against 6 eight-hour shifts with ordinary wire rope. Just double the service (100% increase) is the report of a California Irrigation District. Equipment: A Model 3 Northwest Drag Line with a ¾-yard bucket.

WHAT WOULD A SIMILAR SAVING MEAN TO YOU?

Wire rope replacements are by far the most important item of maintenance for any wire-rope-using machinery. Check wire rope costs on your equipment. Figure what you can save in a year if you use Tru-Lay.

ORDER TRU-LAY NOW . .

Have it on hand—ready to install when your present rope wears out. Watch the performance of Tru-Lay Preformed Wire Rope. Compare it with the service you have been obtaining from ordinary wire rope. Tru-Lay will save you money.

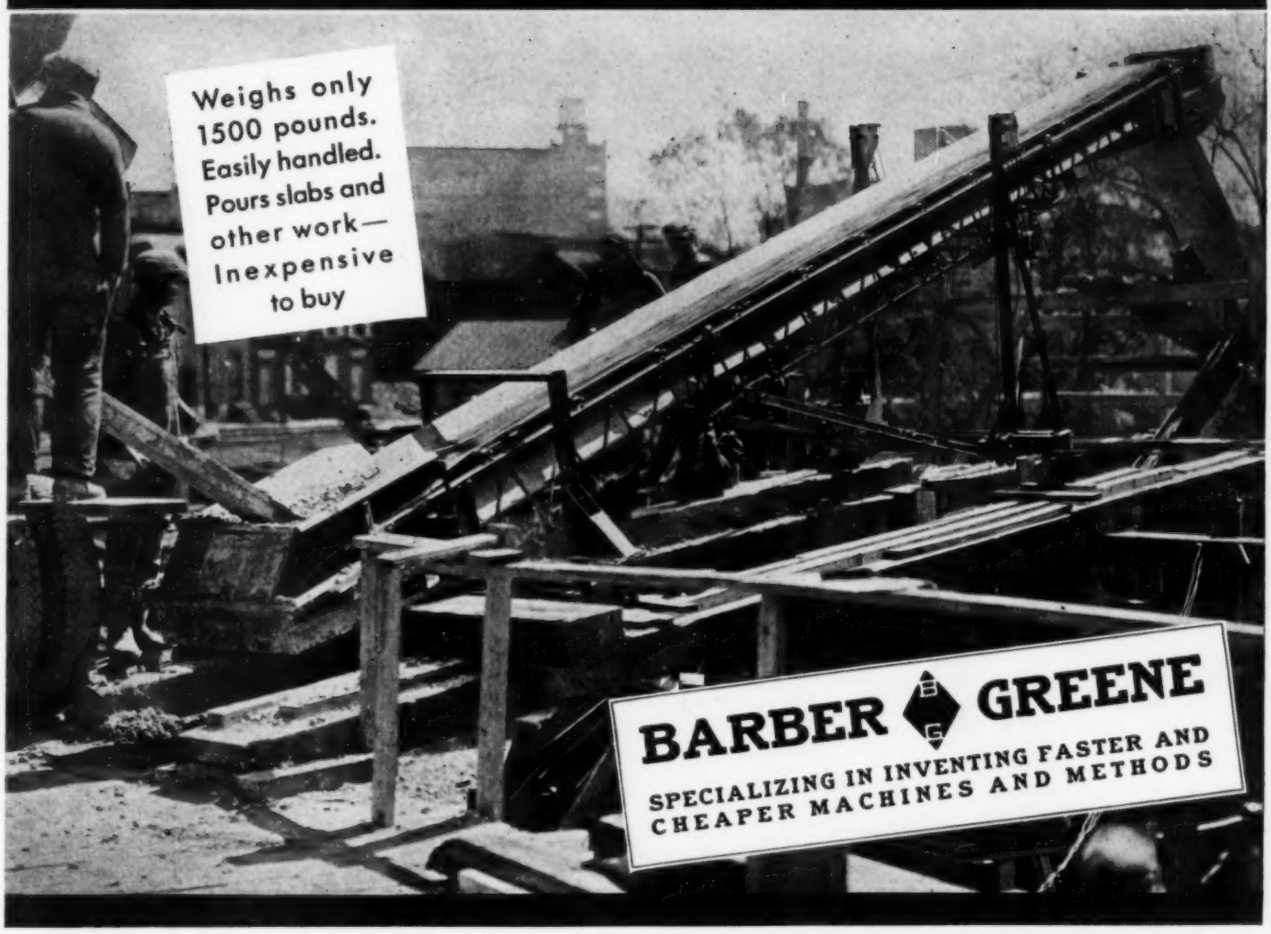
AMERICAN CABLE COMPANY, *Inc.*
New York Central Building
230 Park Avenue, New York, N. Y.
District Offices: Chicago Detroit Philadelphia Pittsburgh Tulsa San Francisco

An Associate Company of the American Chain Company, Inc.

ACCO

PREFORMED WIRE ROPE — TRU-LAY

New Barber-Greene for Wet Concrete Handling


Weighs only 1500 pounds. Easily handled. Pours slabs and other work—Inexpensive to buy
BARBER GREENE
SPECIALIZING IN INVENTING FASTER AND CHEAPER MACHINES AND METHODS

Because of the tremendous success of belt conveyors for pouring wet concrete in caissons, foundations, slabs, building floors and similar concrete handling jobs, *Barber-Greene has developed a new conveyor designed especially for such work.*

It is the original Barber-Greene Belt Conveyor idea specialized to the ultimate degree.

It is light in weight, non-spilling, self-cleaning, easily handled, and particularly suited to its job.

The open charging end eliminates danger of concrete building about pulley and facilitates cleaning.

A special feeding hopper keeps the flow of concrete on the belt uniform.

Eight inch end pulleys reduce belt wear and sticking concrete.

Ball-bearing full caster wheels make moving easy.

Conveyor can be had with elevating truck to regulate discharge height—or semi-adjustable truck for series use.

Conveyors carry a special discharge hopper for feeding the next conveyor in line without spillage—or with discharge hopper and a special swivel-mounted distributing spout for pouring.

A five horse power motor is enclosed within boom, driving to the head pulley with a high-speed Diamond Chain.

An adjustable squee-gee on the return belt wipes all wet concrete off the belt to lengthen belt-life.

Special troughing carriers provide a deep, steep-sided trough that practically eliminates spillage.

And best of all this new conveyor is very inexpensive, bringing the belt conveyor idea into range for almost every job, big or small.

STANDARDIZED MATERIAL HANDLING MACHINES

This coupon brings complete details on the new Wet Concrete Barber-Greene Conveyor—and a copy of "Concrete Handling" (the wet concrete handling performance book). Send today.

BARBER-GREENE COMPANY, 530 West Park Avenue, Aurora, Illinois

Name .....

Address .....

City ..... State .....

Eight Moto-Mixers of the fleet of the Smith Paving Company, Detroit, Michigan

Three of a fleet of six Moto-Agitators sailing the streets of Philadelphia for Warner Company

TRUCK MIXERS AND A

Seven Moto-Mixers make up the fleet of the Melrose Building Material Company, Oakland, California

To Philadelphia, Detroit, California

Almost each day sees Rex Moto-Mixers and Moto-Agitators go into some new town. At this writing, fleets are on their way to Boston and Washington.

Contractors are learning how Moto-Mixers and Moto-Agitators earn profits. Commercial plant operators find more profits in every zone of operation.

Two years on the proving ground, three years on the market, Moto-Mixers and Moto-Agitators are swinging into leadership. They are designed and built to earn profits for you.

They weigh less. They carry greater payloads. They put less burden on their trucks.

They charge faster. Dollars are saved at the batch plant. They discharge over a wide range. More time, men and money are saved.

They have a proved mixing action. Their concrete meets all specifications. Their water control is accurate.

They can be mounted on any truck or trailer, old or new, of proper capacity.

That is why fleets of Moto-Mixers and Moto-Agitators are appearing in towns and cities throughout the United States.

Get complete information today.

CHAIN BELT COMPANY

1664 W. Bruce St. *Cable Address:* **Beltchain** **Milwaukee, Wis.**

CHAIN BELT COMPANY
1664 West Bruce Street, Milwaukee, Wis.
Cable Address: Beltchain

This coupon brings complete information on Rex Moto-Mixers, Moto-Agitators and other Central Plant Equipment.

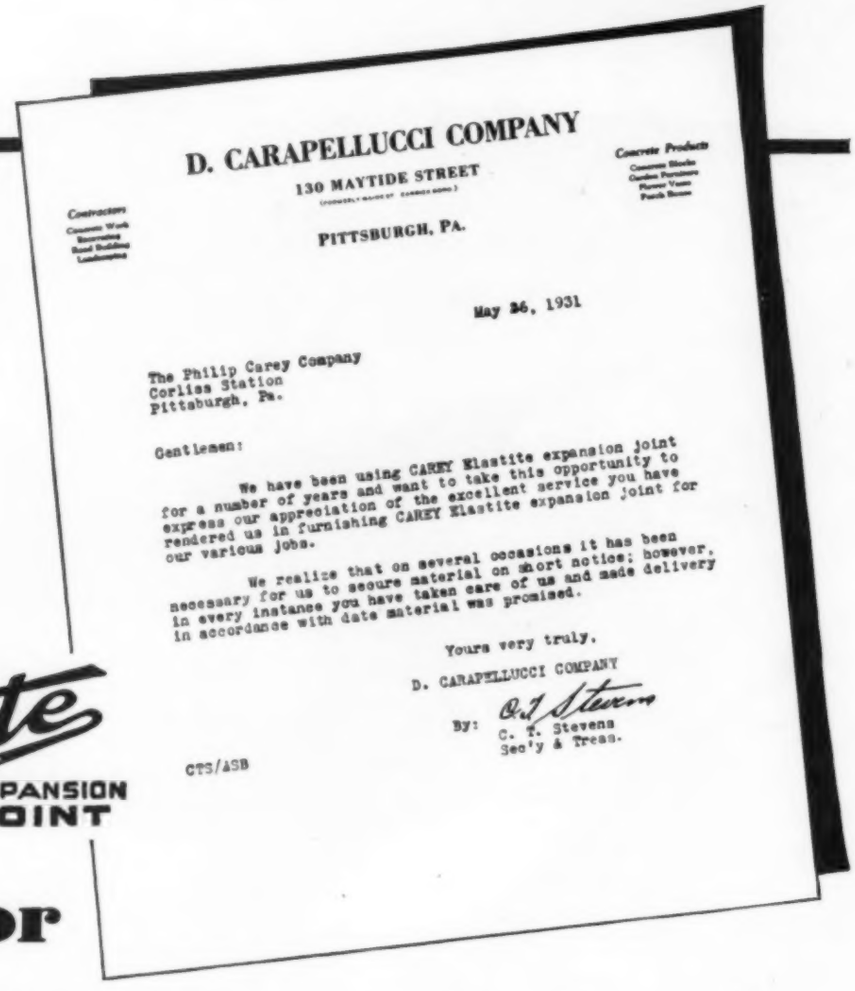
REX MOTO-MIXERS
Moto-Mixers—2, 3, 4 cubic yard capacities.
Moto-Agitators—3, 4½, 6 cubic yard capacities.
Also: 28-S, 56-S and 84-S, central plant mixers, elevators, cement unloaders, belt conveyors.

Your Name .....

Address .....

City ..... State .....

AGITATORS



D. CARAPELLUCCI COMPANY

130 MAYTIDE STREET

PITTSBURGH, PA.

Contractors
Concrete Work
Excavating
Road Building
Landscaping

Concrete Products
Concrete Blocks
Garden Furniture
Flower Vases
Porch Boxes

May 26, 1931

The Philip Carey Company
Corliss Station
Pittsburgh, Pa.

Gentlemen:

We have been using CAREY Elastite expansion joint for a number of years and want to take this opportunity to express our appreciation of the excellent service you have rendered us in furnishing CAREY Elastite expansion joint for our various jobs.

We realize that on several occasions it has been necessary for us to secure material on short notice; however, in every instance you have taken care of us and made delivery in accordance with date material was promised.

Yours very truly,

D. CARAPELLUCCI COMPANY

By: C. T. Stevens
Sec'y & Treas.

CTS/ASB

Carey Elastite
EXPANSION JOINT

chosen for *Proved* Quality and Service

(20 Years in U. S. Highways)

Engineers and road builders specify and use Carey Elastite Expansion Joint for two reasons. Its quality has been proven by the only reliable test—20 years of service in highways in every section of the United States. And Carey shipping service is just as good as the product, for distributors in all principal centers carry complete stocks, so that any order can be delivered on the job without delay.

Proven quality—certain service—minimum prices—these are the causes of the increasing preference for Carey Elastite, the expansion joint with the tough felt walls. We will supply samples, price list and trade discounts on request; also the name of nearest distributor.

THE PHILIP CAREY COMPANY × Lockland, Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
ROOF PAINTS

Carey PRODUCTS

HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

554

TAKE A GOOD LOOK AT THE

540 FT. SCHRAMM

New in size only . . . the biggest portable compressor on the market . . . but completely Schramm in design, with all the famous Schramm features, Schramm materials and workmanship, Schramm dependability, convenience and interchangeability.

The heavy-duty, self-aligning Clutch . . . easy starting . . . just turn over engine and throw in clutch . . . and that's why we can build 'em big like the 540. Multi-cylinder units . . . well balanced . . . free from vibration . . . light in weight, therefore, a real portable outfit.

The 540 cu. ft. takes care of the big jobs. There are also other sizes of Schramm portables ranging from 36 to 360 cu. ft. that cover every possible requirement. *Bulletin 3106 tells all about this new "Giant."*

BRANCH OFFICES:

New York Philadelphia Pittsburgh San Francisco Tulsa Chicago
Boston Birmingham Los Angeles Portland, Ore.

Schramm Inc.

West Chester, Pa.
Representatives in
All Principal Cities

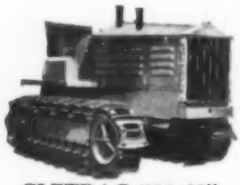
When the BIDS are OPENED...

CLETRAC "15"

CLETRAC "20"

CLETRAC "40-30"

CLETRAC "40"



CLETRAC "80-60"

that's when users of MODERN EQUIPMENT get the "breaks"

COMPETITION was never keener than it is today. Bids are pared close in the fight for contracts and only the man with fast up-to-date equipment can hope to get today's business *at a profit.*

Modern equipment is the key to cheaper operation on any job — and this year of all years is the time to use it to advantage.

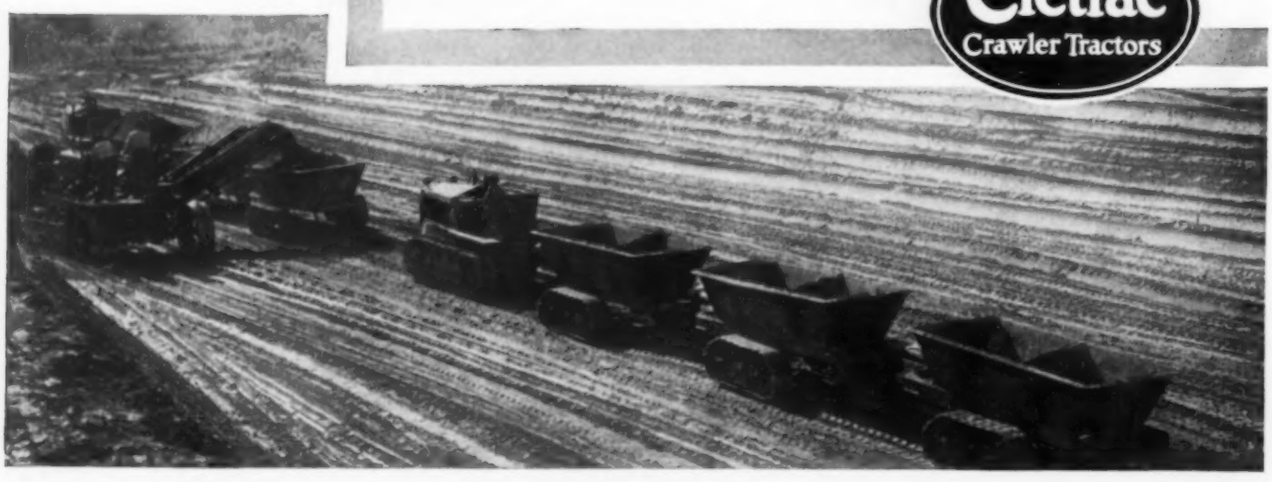
Where there's dirt to be moved, where new highways are being built or old ones repaired—wherever speed and power are cost factors in the job you want — let fast, economical Cletrac Crawlers help you land the contract and complete it profitably.

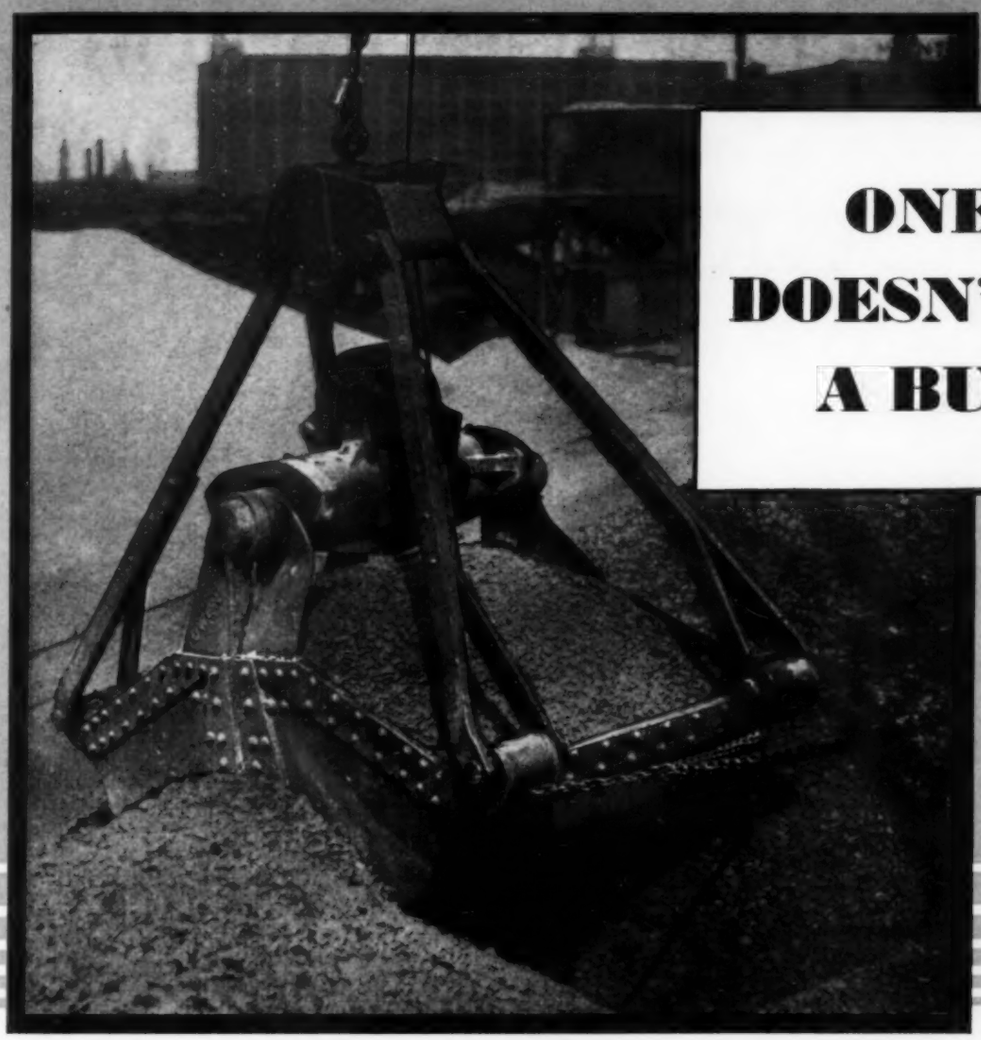
Cletrac Crawlers are available in five different sizes—from 15 h. p. to 80 h. p. They are efficient, up-to-date units that you can depend on to cut expenses and earn you money.

Let the nearest Cletrac dealer give you the facts through actual demonstration — or if you prefer, write for full information.

THE CLEVELAND TRACTOR CO.
19323 Euclid Ave. Cleveland, Ohio

Cletrac
Crawler Tractors





ONE JOB DOESN'T MAKE A BUCKET

IT'S THE OWEN DAY-AFTER-DAY, JOB-AFTER-JOB EFFICIENCY THAT COUNTS

"A Bigger Day's Work"—the Owen guarantee promises. And that's not a single job promise either.

"A Bigger Day's Work"—that means whenever, wherever you put an Owen to work—today, tomorrow—day-after-day, year-after-year.

"A Bigger Day's Work"—that's the continuous result when an Owen performs on today's job and the next—and the next—fast, sure, dependable, getting a mouthful at every bite—unfailingly.

"A Bigger Day's Work"—that's your Owen, cutting operating costs, paying it's way on every contract—over and over again.

All-around clamshell bucket ability that lasts. A bucket that proves more convincingly the longer it works for you that "A Bigger Day's Work" is the best argument for owning an Owen.

You might want to know why an Owen is more than a one-job bucket. Send for the 17 Points of Owen Construction.

The Owen Bucket Company
6023 Breakwater Ave., Cleveland, Ohio

A MOUTHFUL AT EVERY BITE

OWEN CLAMSHELL BUCKETS

Owen Buckets

FOR THE EMERGENCY JOB
depend on
CARBIC LIGHT

Carbic Flood Lights are dependable aids for the emergency job. Rugged, durable, portable, they furnish a means of combating the time factor wherever work must continue after daylight hours.

Carbic Flood Lights afford ideal illumination. Their powerful clear, white light is perfectly diffused so there is no glare and no dark shadows. Yet their penetration of fog, smoke and dust is remarkable. The Carbic Flood Light operates equally well in hot or freezing weather and stubbornly resists wind-driven rain or snow. Reflectors are chromium plated.

Acetylene for the Carbic Light flame is generated from Carbic. Each cake of Carbic of a size will produce practically the same number of cubic feet of acetylene. Thus the generator can be charged easily for the required period of operation. The initial cost of the Carbic Flood Light is low and the operating expense is negligible. You can depend on Carbic Flood Light.

Sold by leading jobbers everywhere

CARBIC
PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

District Offices

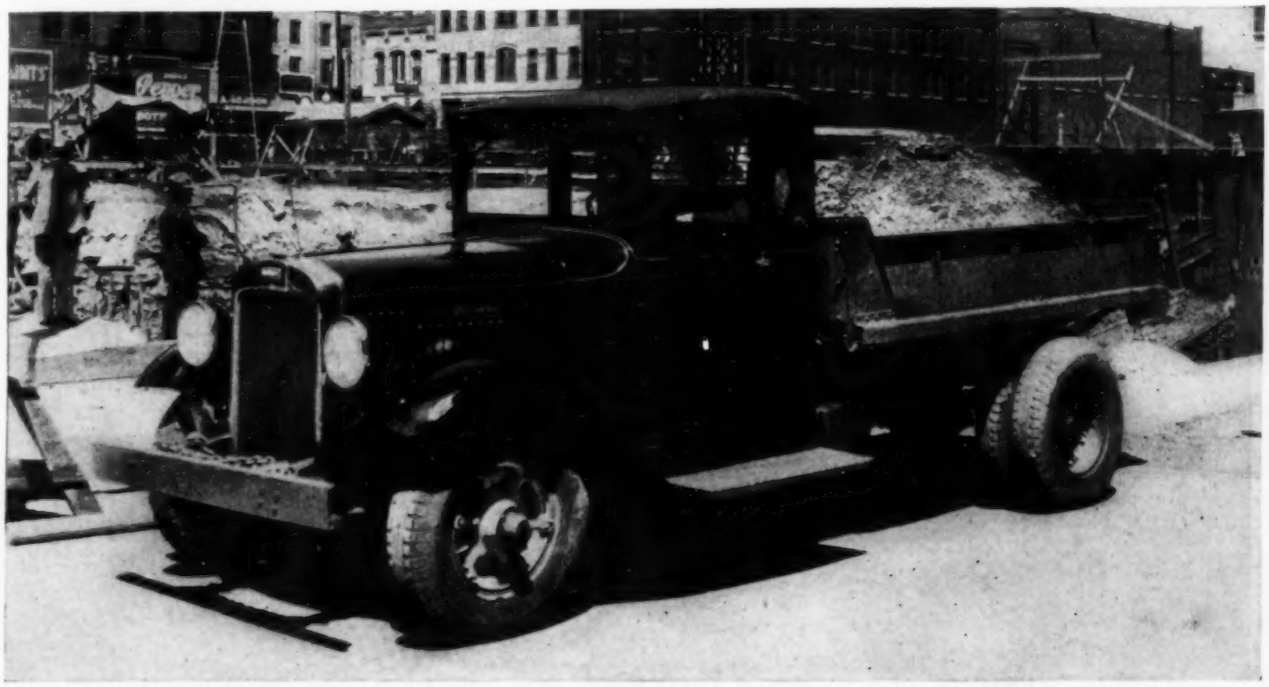
Atlanta	Detroit	New York
Baltimore	El Paso	Philadelphia
Birmingham	Houston	Pittsburgh
Boston	Indianapolis	St. Louis
Buffalo	Kansas City	Salt Lake City
Chicago	Los Angeles	San Francisco
Cleveland	Milwaukee	Seattle
Denver	Minneapolis	Tulsa
	New Orleans	

LINDE OXYGEN · PREST-O-LITE ACETYLENE · OXWELD APPARATUS AND SUPPLIES · UNION CARBIDE

The new low price of Carbic is $6.00 a drum in Zone 1, $6.50 in Zone 2, and $7 in Zone 3. Write for Zone map.

OVER 400,000 DODGE TRUCKS

CHOSEN BY TRUCK USERS



—and the experience gained in building this huge volume safeguards your choice today

Contractors and other business men — with every conceivable kind of hauling job to do— *have purchased over 400,000 Dodge Trucks.* » » What more conclusively proves the solid worth of these dependable workers? And what could be more advantageous to you than the *experience* gained by Dodge engineers and workmen in the designing and building of this enormous total. Such *experience* assures the modern design, precision construction and part-to-part balance that mean even greater Dodge dependability, lower costs and more able performance throughout the truck's unusually long life. » » Inspect and test Dodge Trucks—especially the Standard 1½-ton chassis which is only $595, f. o. b. Detroit. You will say they are every inch modern trucks—exceptional values at their low prices.

PAYLOAD CAPACITIES IN THE HEAVY-DUTY LINE RANGE FROM 3,600 TO 11,175 POUNDS—AND UP, FOR TRACTOR AND TRAILER SERVICE. PRICES ARE EXCEPTIONALLY LOW. » » THE STANDARD LINE RANGES IN PAYLOAD CAPACITY FROM 1,200 TO 4,300 POUNDS AND INCLUDES THE 1½-TON CHASSIS AT . . . . . $595 F. O. B. DETROIT

TO HELP LOWER YOUR HAULING COSTS
OPERATING RECORD BOOK FREE

DODGE BROTHERS CORPORATION D-8
Detroit, Michigan

Send your Operating Record Book. I understand there is no obligation.

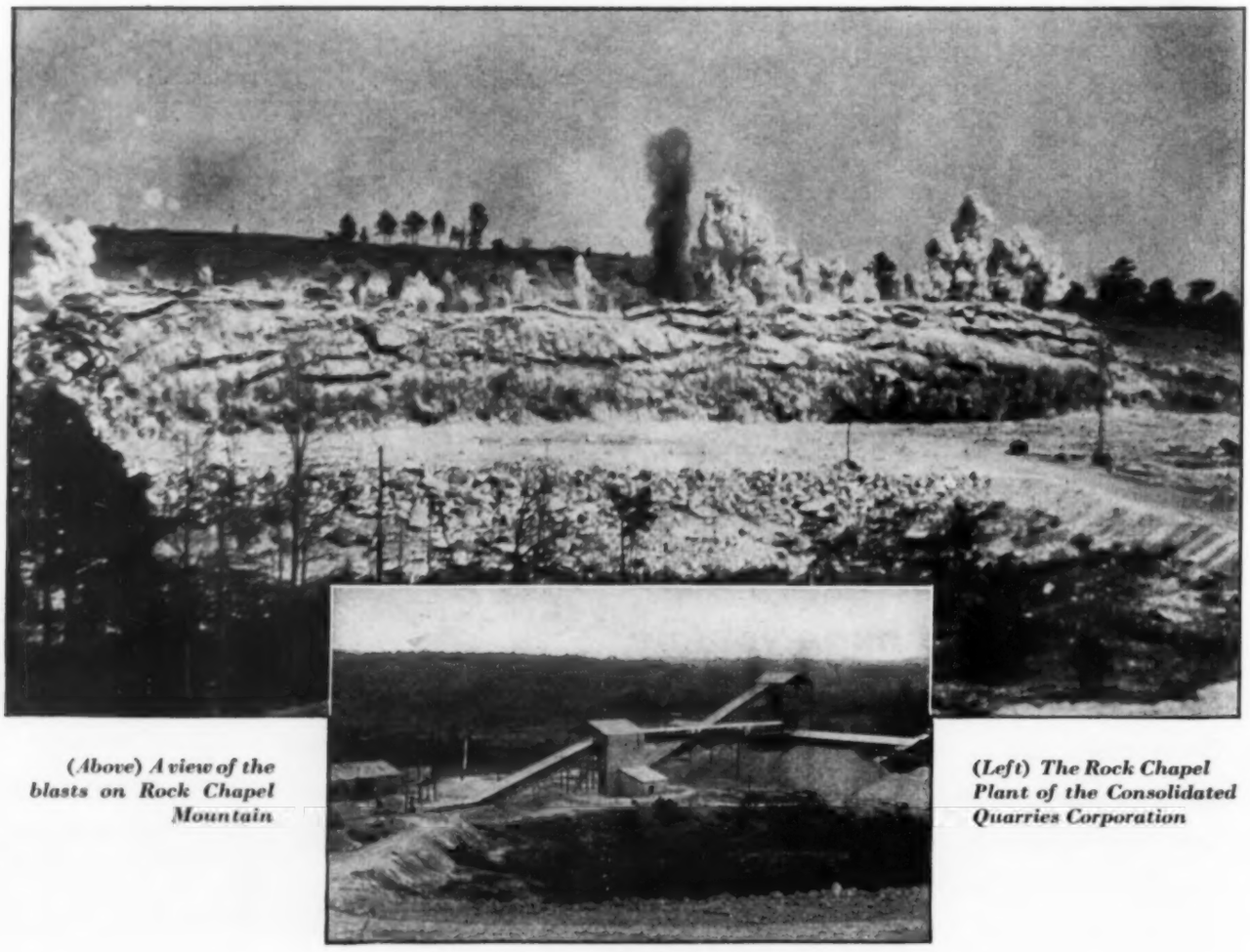
NAME_____

ADDRESS_____

CITY_____ STATE_____

Number of Trucks Operated (*Book for each will be sent*)_____

Moving OF GRANITE



(Above) A view of the blasts on Rock Chapel Mountain

(Left) The Rock Chapel Plant of the Consolidated Quarries Corporation

DU PONT
REG. U. S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC.

EXPLOSIVES DEPARTMENT • WILMINGTON, DELAWARE

a mountain

WITH DU PONT EXPLOSIVES

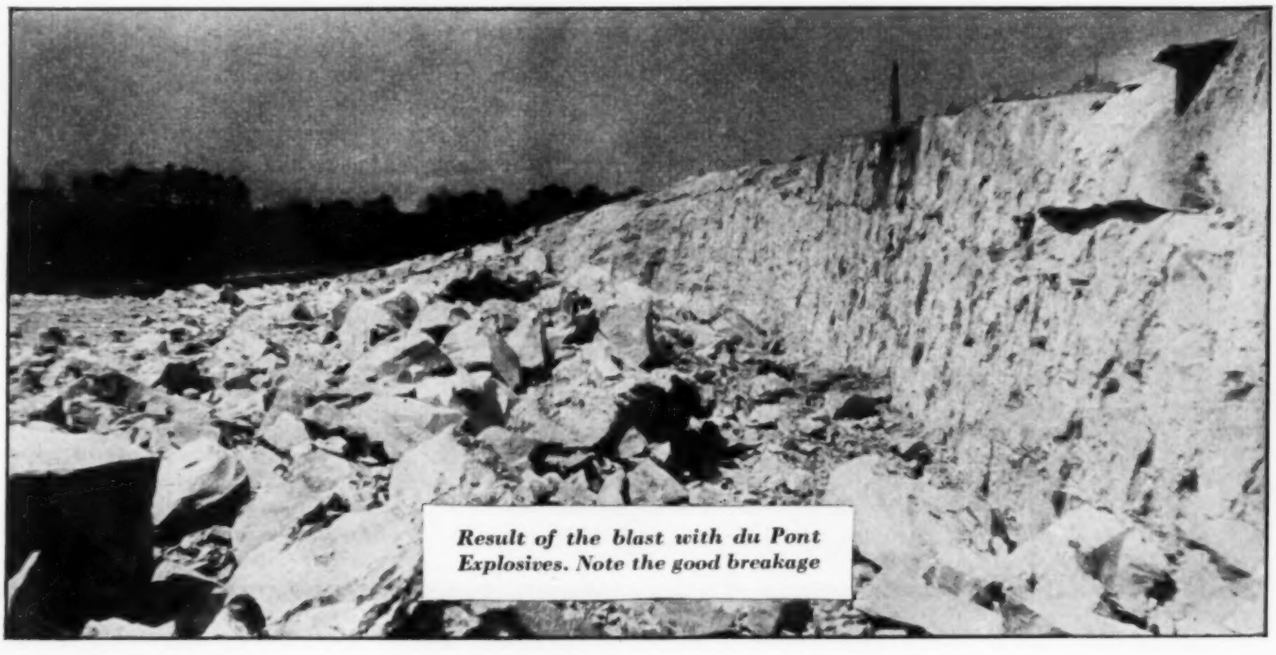
Consolidated Quarries Corporation at Lithonia, Georgia, uses these famous explosives for efficiency in operation and good breakage

THE deposit from which the Consolidated Quarries Corporation secures its material is a huge outcrop of granite known as Rock Chapel Mountain. It is located about ten miles southeast of the famous Stone Mountain.

One of the largest blasts ever made in Georgia was made in this quarry on March 16, 1931. It brought down 80,000 tons of granite. It was a single-row bank shot of 42 holes loaded with du Pont Dynamite. The holes were spaced 18 feet apart, with a burden of 20 feet, and averaged 70 feet in depth. From the photograph below, it is evident that the breakage was unusually good.

Whatever *your* blasting job you'll find there's a du Pont Explosive made especially for it. When you specify du Pont Explosives for the jobs you undertake you specify explosives into whose making has gone more than 129 years of experience. With du Pont Explosives you are assured of satisfactory execution.

Complete information about du Pont Explosives and their use in quarrying and for other purposes may be obtained by writing direct to the du Pont Company. We shall be glad to place your name on our mailing list to receive our Explosive Service Bulletins.



Result of the blast with du Pont Explosives. Note the good breakage

Warm, clear color with cast stone of Atlas White

True-color reproductions of the cast stone facing on the Rhodes Medical Arts Building, Tacoma. John Graham, architect; A. W. Quist Co., general contractor, both of Seattle. Cast stone, made with non-staining Atlas White portland cement, furnished by Pacific Stone Co., Seattle.

COLOR has long been used to beautify the *interiors* of homes, commercial buildings and public structures. For the *exteriors* of these buildings, however, the change from conservative shades to varied and harmonious color combinations and textures has been slower. But the change has come. In most cities and large towns are now found new buildings beautified outside as well as inside with warm, inviting colored facings.

Because of its adaptability to design, its variety and attractiveness of color and its economy, Atlas White cast stone has found favor with owners, designers and builders. Cast stone manufacturers will furnish on request samples of fine cast stone made with either Atlas White or Atlas *Waterproofed* White portland cement.

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CONCRETE FOR PERMANENCE

Universal Atlas Cement Co.

Subsidiary of United States Steel Corporation

CHICAGO · NEW YORK · PITTSBURGH · MINNEAPOLIS · KANSAS CITY

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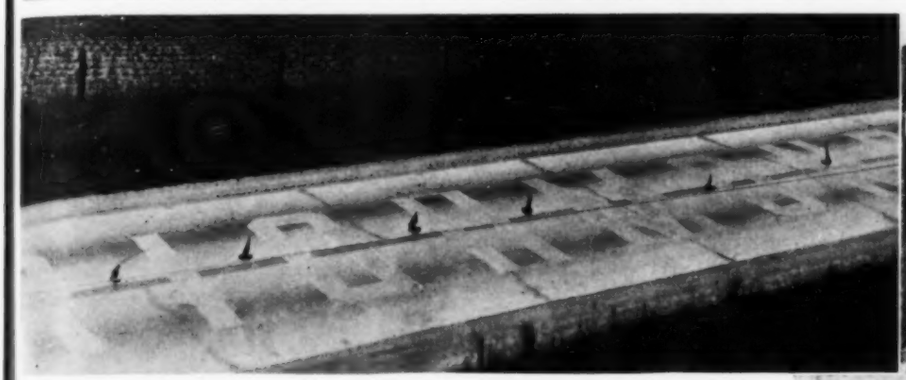
Construction Methods

A McGRAW-HILL PUBLICATION—ESTABLISHED 1919

ROBERT K. TOMLIN, *Editor*

VOLUME 13 NEW YORK, AUGUST, 1931 NUMBER 8



Highways Marked for AIRWAY TRAFFIC

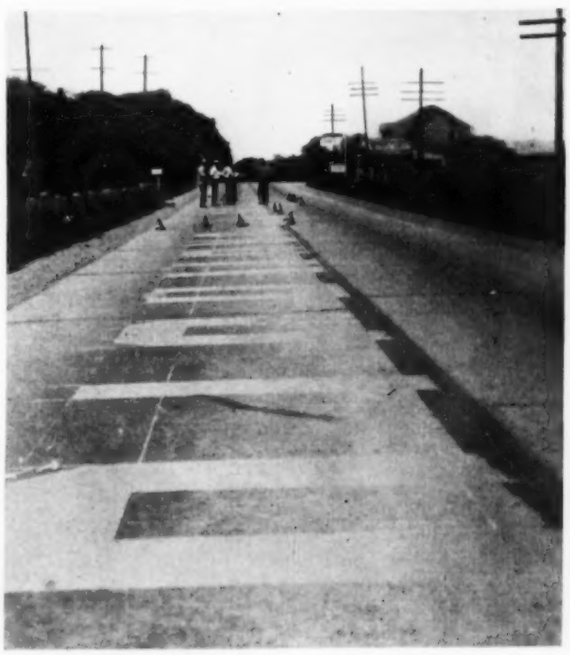
OHIO'S state highway department, along with its many functions, has this year undertaken the installation of 132 huge air-markers on the pavements of the principal highways throughout the state. The air-markers are located with respect to air lanes and, according to present plans, will cover approximately 1,900 miles of highways. The work is being carried on in conjunction with the State Department of Aeronautics.

Ohio's markers are different from those in some states in that they have the name of the town, an arrow pointing in the compass direction and the number of miles to that point. Some states have only the route number shown and this requires the pilot to consult an automobile map to ascertain his location. Although the U. S. Department of Commerce is attempting to standardize aerial signs, so far as is known no great amount of uniformity has been accomplished.

Ohio's standard marker is composed of letters 12 ft. high and 5 ft. wide, with an 18-in. stroke. The abbreviation Mi. for mileage is 8 ft. high, 5 ft. wide with a 12-in. stroke. The arrow is 24 ft. long having a head of 10 ft. long and 8 ft. wide at the base. Spacing between the letters is 5 ft. and between the words 10 ft. The color of the letters is lemon yellow (traffic paint) and the size and color of these air-markers make them easily readable from an altitude of 10,000 ft.

In order that no great amount of expert skill will be necessary in the installation of these air-markers, the design of the letters is in straight lines. Letters are laid out with chalk line and afterwards painted in by hand.

The traffic paint which is used in Ohio requires from 20 to 30 min. to dry, two coats being applied. One-half of the marker is made at a time, allowing traffic to use the other half of the road.



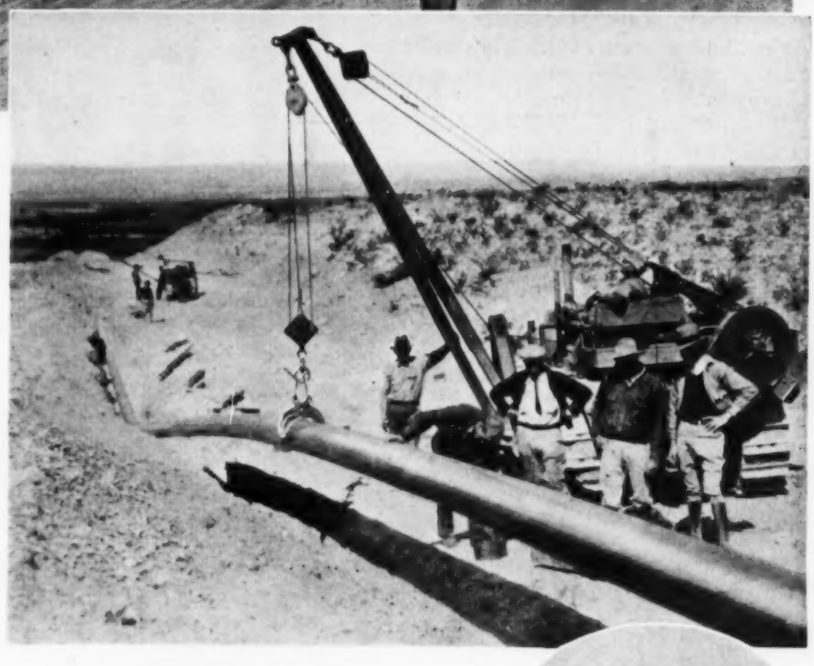
This Month's "News Reel"

ST. JOHN'S SUSPENSION BRIDGE *(below)* built by Multnomah County across Willamette River at Portland, Ore., was dedicated June 13. Total length, 3,608 ft.; suspension span, 1,207 ft.; clearance above mean low water, 205 ft.; width of concrete roadway, 40 ft. Structure was designed by Robinson & Steinman, consulting engineers of New York. Main towers with pointed arches are topped by finials 409 ft. above low water. The towers support Roebling twisted strand cables 16¼ in. in diameter, each consisting of 91 strands.

MART BUILDING *(left)* is 20-story concrete structure under way at St. Louis, Mo., at cost of $5,000,000. It will contain separate merchandise, machinery, furniture, railroad and other marts. E. L. Stancliff heads syndicate of St. Louis business men who will operate the project. The general contractor for the building is the Gamble Construction Co. and W. J. Knight & Co. is engineer and supervisor.

DISMANTLING *(right)* south span of highway bridge over Potomac River at Washington, D. C., in connection with construction of Mt. Vernon Memorial Highway, being built under supervision of U. S. Bureau of Public Roads.

TRIPLE LOADS *(above)* of 8-yd. Euclid crawler wagons are hauled by 80-60 Cletracs on new cut-off for Wabash Railroad between St. Charles and St. Louis, Mo. Grading work is being done by Ed Peterson Co., of Omaha, Neb., under a sub-contract with the Walsh Construction Co. One cut 70 ft. deep requires removal of 257,000 cu.yd. of earth.



300-MILE PIPE LINE, 12 in. in diameter, carrying natural gas for Western Gas Co. from El Paso, Tex., to Arizona and Mexico, has been completed. Maximum daily progress by one gang was 33,900 lin.ft. A. O. Smith Co., of Milwaukee, did the lining up and welding. Strings of ten 40-ft. pipe lengths, welded into 400-ft. section, were used where topography permitted. Completed line was tested at 750 lb. per square inch pressure.

©*Wide World*

MARATHON DAM for supplying water to Athens, Greece, has been completed by American contractors, Ulen & Co., of Lebanon, Ind. The dam, 177 ft. high and 936 ft. long, is faced with the same type of marble as was used to build the Acropolis and other classic Greek structures.

HENRY C. ULEN *(left)*, Marathon dam builder, and ROBERT SKINNER, American minister to Greece.

300 Well-Points Lower Water Level *on Large Outfall Sewer Job*

A BATTERY of 300 well-points is lowering the groundwater level approximately 12 ft. for the construction of Section A of the large, reinforced-concrete Southwestern outfall sewer now being built as part of a $10,000,000 sewer program authorized by the voters of Louisville, Ky., in 1928. Steel sheet-pile walls to retain the trench banks below groundwater level, steel forms for invert and arch, hog rods to hold down the invert forms, a railway for distributing concrete, and a group of draglines to handle excavation are other features of the construction equipment which the Torson Construction Co., Long Beach, Calif., is using on this 2-mile section.

Description of Section A—Included in the contract of the Torson Construction Co. are an outlet structure 256 ft. long, completely submerged in the Ohio river, and two sizes of reinforced-concrete, inverted-egg-section sewer. For 4,254 ft. from the river the sewer section is 15 ft. 8 in. by 23 ft. 6 in. with brick-lined invert on a grade of 0.207 per cent. For the remainder of the sewer's length, 5,810 ft., a grade of 0.087 per cent requires a section 18 ft. 4 in. by 27 ft. 6 in., without a brick-lined invert. Thickness of the wall of the larger sewer is 37½ in. at the flow line, 37 in. at the springing line, and 27 in. at the crown. The corresponding thicknesses for the smaller section are 31½ in. at the flow line, 33 in. at the springing line and 21 in. at the crown.

R. H. LAHMAN *(left)*, junior engineer in charge of Section A; CHARLES M. TORSON, Torson Construction Co., and A. H. BOERNER, construction engineer.

Both large and small sewers are reinforced by two rings of steel bars, 1¼ in. and 1-in. square bars at 6-in. centers being used in the invert, 1⅛-in. square and ¾-in. round at 12-in. and 6-in. centers in the arch, and 1-in. square and ⅞-in. round at 12-in. centers in the side walls.

With the exception of the outlet structure and the transition portion at the outlet, the sewer rests on the natural sand subgrade. Concrete piers

INVERT CONCRETE is delivered in 2-yd. hopper cars and is chuted to place. Hog rods anchored to steel sheet piling hold down invert form during concreting. Timber post under crane boom enables machine to pull sheet pile with load line.

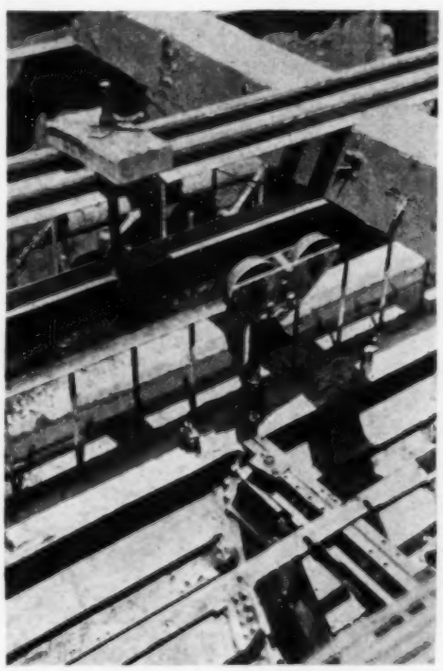
STEEL ARCH FORMS consist of interior collapsible form mounted on jumbo traveler and of back jacket made of steel plate panels, reinforced by channels. Crane moves back jacket ahead. Bulkhead at front end holds material for making watertight contraction joint. Wood arch forms are also used, principally on curves.

7 ft. in diameter, extending to a hard shale foundation, will support the outlet structure, and precast concrete piles will be driven to carry the transition.

Brick lining in the invert of the smaller section, installed to prevent scour caused by the high velocity of the steeper gradient, equals 2.1 sq.yd. per linear foot of sewer. Concrete in the smaller sewer, per linear foot, amounts to 3.37 yd. for the invert and 3.20 yd. for the arch. Proportionately greater quantities are required for the larger section.

At present, the invert and arch of the smaller sewer are poured separately, a construction joint being formed at the springing line. It is expected that this practice will be continued on the larger sewer. The springing line is at a height equal to one-half the horizontal diameter.

Excavation—Total excavation on Section A amounts to approximately 625,000 yd. The new sewer follows the course of an open, storm-water channel, with grassed slopes, which the Commissioners of Sewerage built several years ago. Depth of cut on the larger sewer section, for 3,500 ft. of its length, is about 35 ft. below the existing channel and 45 ft. below the surface of the ground. The maximum cut for this section is 38 ft. below existing channel and 65 ft. below ground surface. For the smaller sewer, the cut is much shallower, being about 25 ft. below the bottom of the old channel and approximately 35 ft. below the original ground.



DOLLY ON TROLLEY BEAM moves invert form ahead.

The groundwater plane apparently rises on a grade approximating 0.5 per cent from river pool. Average height of groundwater table above subgrade is about 17 ft.

General Construction Plan—Construction was started at the river end of the smaller sewer and is being carried forward in a direction away from the river. Successful operations depend on the lowering of the groundwater level. The Torson Construction Co. is unwatering excavation to 12 in. below subgrade with 300 well-points operated by six 6-in. Moretrench pumps. To reduce the quantity of excavation and to afford a means of bracing and holding down the invert forms during concreting, the trench is sheeted below groundwater level with steel sheet piles. Excavation is carried on by draglines. The first cut is made, in advance of the well-points, to a couple of feet below groundwater level, After steel sheet piles and well-points have been installed, and after the well-points have lowered the water level below subgrade, a dragline excavates

the remainder of the trench between the sheet-pile walls. Invert forms then are erected on the dry subgrade. Pouring of the arch follows a couple of hundred feet behind the invert.

Two Link-Belt 1¼-yd. gasoline dragline machines make the first cut, one operating on each side of the trench. This cut is made to a grade slightly below groundwater level to start drainage of the water back to the well-points. The draglines work 700 ft. ahead of the steel sheet piling and 900 ft. ahead of the invert concrete.

Steel Sheeting—Interlocking Lackawanna steel sheet piling 24 to 28 ft. long is driven from 3 to 8 ft. below subgrade and about 3 ft. outside the line of the sewer wall. As excavation between the steel sheet-pile walls progresses, the walls are braced with steel channel wales and 12x12-in. timber cross-struts at 9-ft. centers 13 ft. above subgrade. A Marion steam crane with a 40-ft. boom drives the sheet piles, and a Link-Belt gasoline

RIVERSIDE CONCRETE PLANT is supplied with sand and gravel by barges. Trucks deliver sacked cement up ramp under water tank.

pump on each side of the trench. Discharge from the pumps is piped over the spoil bank into a ditch which carries the water to the river. The contractor is equipping all the pumps with G.E. electric motors fed by a power line brought into the center of the job. A number of well-points made at the blacksmith shop on the job are used where needed to supplement the Moretrench points. These job-made points require an outside jet to sink them.

As rapidly as the well-points lower the water in the trench, a Marion gasoline-electric ¾-yd. dragline excavates the remaining material to subgrade, depositing the spoil against the slope outside the sheet-pile wall. A Marion steam crane with a ½-yd. clamshell bucket works in conjunction with this dragline, rehandling the material to the spoil bank outside the excavation.

Concrete Forms—Forms for both invert and arch are in sections 30 ft. 4 in. long. The Torson Construction Co. is using three steel arch forms, two wood arch forms, and three steel invert forms. Each steel form section

ROLLERS suspended from timber cross-braces are used in moving trolley I-beams.

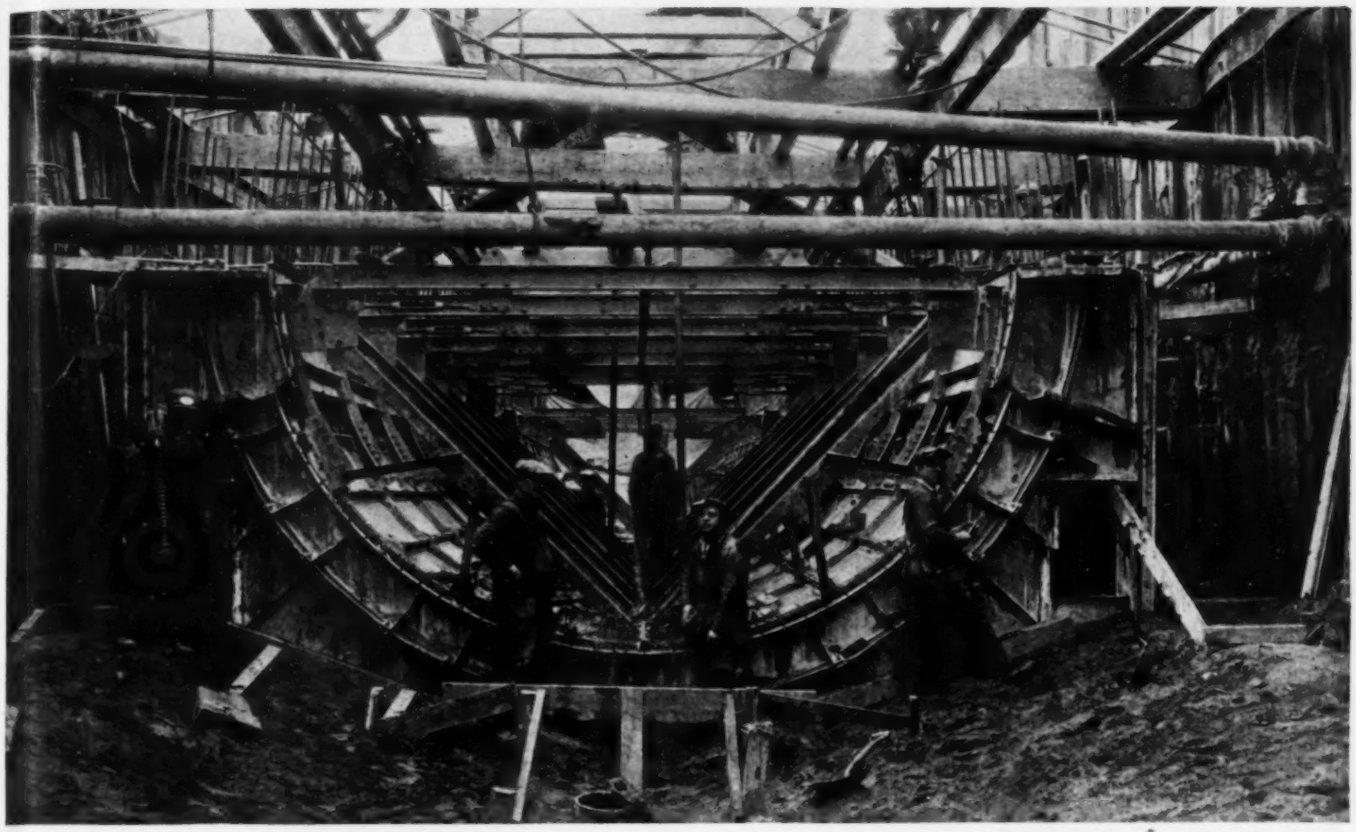
ELECTRICALLY-DRIVEN PUMP is one of the six taking water from 300 well-points.

JETTING WELL-POINTS 3 to 8 ft. below subgrade. Connections to header pipe provide for well-points 3 ft. apart.

crane with a 65-ft. boom pulls the sheeting. For driving the piles, the contractor uses a McKiernan-Terry No. 7 steam hammer swung on the load line of the crane. The hammer is equipped with steel extensions, 2 ft. long, which fit over the pile. To pull a sheet pile, a timber pole is placed under the tip of the crane boom, with the bottom of the pole resting on the sheet-pile wall, and the crane pulls the pile with its load line. A photograph illustrates this method.

Well-Points—After the sheeting has been driven, Moretrench well-points on 3-ft. centers, 18 in. from the sheet-pile wall, are jetted to 8 ft. below subgrade and are connected to the 6-in. header pipes leading to the pumps. The six pumps are placed in pairs about 150 ft. apart, with one is equipped at the forward end with a specially-designed steel bulkhead to hold the metal strip and premolded asphaltic composition sheets used in making the watertight contraction joint between sewer sections. Invert forms are required to be left in place 36 hours and arch forms 48 hours after concrete has been placed against them.

As illustrated by the photographs, the invert forms are braced from the steel sheet-pile walls and are held down by hog rods during the pouring of the concrete. A turnbuckle connection in each hog rod makes it possible to place an initial tension in the rod before any concrete is poured. The photographs also illustrate the method of moving the invert form ahead on a trolley carrier which runs on the lower flange of an I-beam suspended from



STEEL INVERT FORM, moved forward by trolley carriers, is placed on subgrade drained by well-points and is braced from sheet-pile walls. Bulkhead holds material for waterproof contraction joint.

two rails carried by the 12x12-in. timber cross-braces. Turnbuckles and threaded rods attached to the trolley carriers are used to raise and lower the invert form.

Inside arch forms are of the Blaw-Knox collapsible type, mounted on a jumbo which travels on steel rails laid on the invert. The contractor made up the outside arch forms, or back jackets, of steel sheet panels 2 ft. 4 in. wide by 18 ft. long reinforced at every transverse joint with a light steel channel. These jackets are held in place by cones and ¾-in. spreader bolts. A Link-Belt crane with a 65-ft. boom moves them ahead.

Concrete—A concrete plant equipped with a Smith 2-yd. gasoline-powered mixer and Blaw-Knox 250-ton steel bins and volume batchers was placed on the river bank where barges of sand and gravel could be unloaded by a steel stiff-leg derrick directly into the bins. Sacked cement is hauled by truck from the mill, a distance of 18 miles.

A 36-in. gage railway delivers concrete from the mixing plant to points along the bank of the trench. Two Plymouth gasoline locomotives haul trains of two 2-yd. hopper cars each. Chutes equipped with control hoppers convey the concrete from the railway car to the forms or to a bucket. Invert concrete can be chuted directly into the forms. At present, the contractor is using a hopper bucket, filled by chute, and a Link-Belt crane to place the arch concrete. The crane and bucket arrangement is to be replaced by a belt conveyor, which will receive the concrete from the chute and will elevate it to the forms.

GASOLINE-ELECTRIC DRAGLINE on bottom of trench excavates remaining material between steel-sheet walls as well-points lower water level. Material is rehandled to spoil bank by second machine with clamshell bucket.

All reinforcing bars are Jones & Laughlin and Carnegie new billet steel shipped to the job in barges. The walls of the sewer are sufficiently thick to permit workmen to spade concrete around the reinforcing steel inside the forms. Ten men do the spading, operating in pairs, with five men on each side of the form.

Particular care is taken to obtain a good bond at the construction joint between the invert and arch. Before starting to pour the arch concrete, workmen pick off all laitance from the invert concrete and slosh it with a mortar consisting of one part cement and two parts sand, to which has been added 10 lb. of hydrated lime for each sack of cement used.

A Link-Belt 2-yd. gasoline dragline backfills the trench with material from the spoil banks.

Administration—Section A of the Southwestern outfall sewer is being built by the Commissioners of Sewerage of the city of Louisville, under the direction of Woolsey M. Caye, technical engineer, and A. H. Boerner, construction engineer. R. H. Lahman is junior engineer in charge of the section. Charles M. Torson personally directs operations of the Torson Construction Co.

POWER SHOVEL crawls shoreward from stranded barge.

SAND-ASPHALT ROAD

Along Ocean Shore Line

HANDICAPPED by lack of ordinary transportation facilities and with no satisfactory stone or gravel available within several hundred miles, a sand-asphalt highway 10.7 miles long has recently been completed on the narrow sand spit that forms the ocean shore line of North Carolina for more than 150 miles. On the land side of the spit, which varies in width from ½ to 2 miles, are clear, shallow land-locked sounds of salty or brackish water that are as much as 50 miles wide in places. The inland shores of these sounds also are usually low and marshy, with railway lines generally back some distance from the main body of water. About midway in the 150-mile-long, sand spit lies Cape Hatteras. During the day, and frequently at night, constant, fresh, northeast winds sweep the exposed beach. At certain seasons storms of great intensity occur.

ROUGH GRADING is done by strikeoff pulled by tractor along creosoted-wood side forms.

ACROSS SWAMP sand fill forms grade. Sugar cane stocks, at left, help traffic in dry weather.

At its north end the sand-asphalt project connects over a 3-mile creosoted pile bridge across one of the sounds with a road of the state system. At the south end the new road joins a 5-mile state highway project previously built to form a connection with Roanoke Island.

The sand that forms the barrier beach between the ocean and the land-locked sounds is remarkably clean and uniform. Except right at the ocean line practically all of this sand will pass a 40-mesh screen, and an average of 65 per cent is retained on an 80-mesh screen. Dust and exceptionally

fine particles are absent, as is indicated by the fact that none of the sand will pass a 200-mesh screen.

This local sand is the only available road-surfacing material. It lacks enough coarse material, however, to serve satisfactorily in a sand-asphalt mixture. After extensive studies the engineering department of the state highway commission determined that by carefully blending this sand with that from near the mean-tide line on the ocean shore a properly graded material could be obtained. Only by this expedient was the scheme of constructing an all-weather highway along the 150-mile spit made practical.

The fine, loose sand of the barrier beach is exposed, without vegetation to hold it, to the almost constant northeast wind that for an average of about 40 days a year exceeds 40 miles an hour, and on 13 days exceeds 60 miles. Thus a great shifting of surface occurs.

Shaping the subgrade for the sand-asphalt surfacing was done with a crawler-tractor pulling a heavy wooden strike off that rode on the forms for the surfacing. This subgrade work was kept only a short distance ahead of the placing of the base, however, to avoid shifting of the material by the wind. On account of the character of the sand subgrade it also was necessary to do some hand dressing of the subgrade immediately in advance of the surfacing.

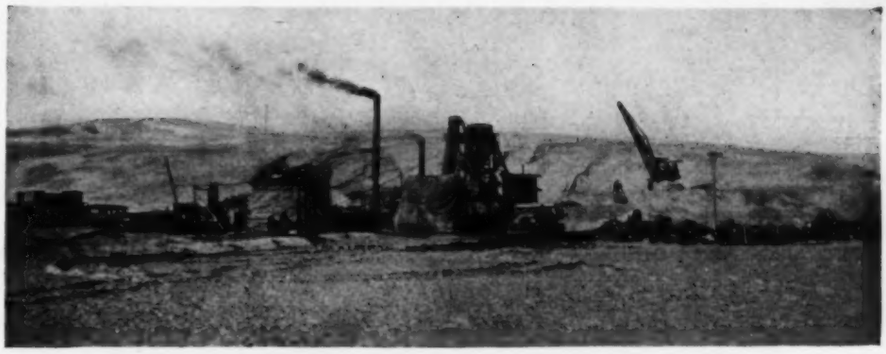
The sand and asphalt were mixed in a central plant set up on the windward side of a great dune from which most of the sand was taken. One saving grace of the material supply was the fact that the only expense of delivering it to the plant was to excavate it with a clamshell on a power crane. The latter worked on the face of a pit with practically an unlimited supply in reach from one setup.

Water transportation afforded the only opportunity to move equipment to the job site. There were no railroads and no highways. Hauling heavy loads through the fine, loose sand would have been difficult. The contractor, therefore, chose the water route.

In addition to the heavy boilers and other equipment of the central mixing plant a power shovel, road rollers and various other units were loaded on a large barge at the nearest convenient rail point. While this barge was being towed to a point on the sound side of the spit where plans had been made to unload it, a storm grounded it in shallow water near shore. A ramp of timbers was built from the deck of the barge to unload the equipment.

Light trucks with dual rear wheels were found quite effective in delivering coarse sand from the beach to the central mixing plant. With hauls upwards of half a mile through the fine, loose sand of the spit these trucks handled their rated capacity loads without difficulty. Balloon tire pressures were maintained at only 20 lb., which was the only change made from regular hard-road operating conditions.

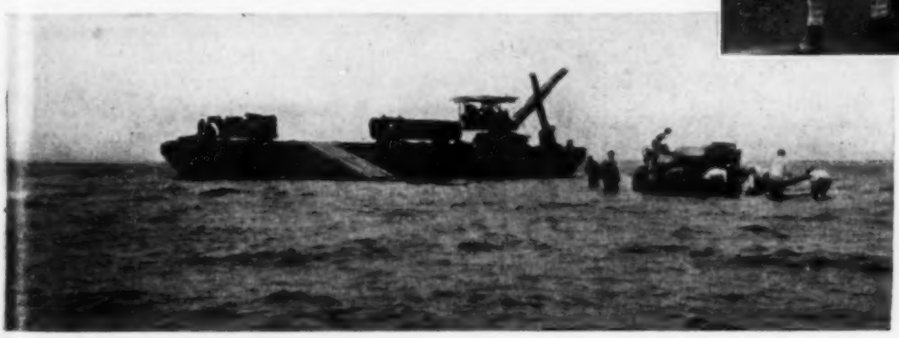
Deliveries of sand asphalt from the



SAND-ASPHALT MIXING PLANT set up alongside a huge sand dune.

FRESNOS and slip scrapers *(above)* shape grade in fine sand.

STATE HIGHWAY PERSONNEL *(left to right)* JOHN D. WALDROP, state highway engineer; J. C. GARDNER, district engineer; FRANK C. KULGER, commissioner, NEELY J. CROMER, resident engineer, and WILLIAM HAWKINS, construction engineer.



FROM STRANDED BARGE *(left)* road-building equipment is unloaded.

WOODEN STRIKEOFF ahead of finishing machine produces accurate subgrade.

central mixing plant to the point where surfacing operations were in progress were also made in light dump-body trucks. The surfacing was placed in two courses. A 3-in. base of a mixture containing 1 part of beach sand to 4 parts of the dune sand with 8 per cent asphalt of 55-penetration was first laid. On this was placed a 2-in. wearing surface of a mixture of 1 part of beach sand to 3 parts of dune sand with 10 to 11 per cent of 55-penetration asphalt. The surfacing course also contains 7 to 8 per cent of limestone dust.

The base generally was laid about a mile ahead of the surfacing course. Side forms of creosoted 2x6-in. plank were set in the sand subgrade accurately to line and grade of the surfacing. A Lakewood finisher was used to strike off both the base and the surface coats. The trucks dumped the material on a heavy iron plate shifted directly ahead of the finisher. The latter was specially fitted for this job with an extra wooden strikeoff, or template, set about 3 ft. ahead of the regular strikeoff of the machine. Ahead of this template the subgrade was shaped by hand shovelers who threw out excess material and filled the low spots.

In this manner the subgrade was accurately fine-dressed immediately ahead of the placing of the base material which was then hand-cast over the wooden template on the finisher from the steel dump board to which the trucks delivered it. Four shovelers working in pairs to spell each other handled this job.

With the base laid ahead, the surfacing course was placed with the trucks and finished by the machine. A section equal to an estimated day's work was laid off at the end of the completed base toward the mixing plant. Beginning at the far end of this section the surface was placed backward toward the plant. Directly in advance of the placing of the top course the base was squeegeed with about $\frac{1}{12}$ gal. of 55-penetration asphalt to the square yard. Extensive experience in sand-asphalt construction in North Carolina has shown that this squeegee application insures a good bond between the base and the surface course.

N. J. CROMER, resident engineer; J. R. LOVE, superintendent for Robert J. Lassiter & Co.; J. ED. PLATT, P. A. CAMERON and M. J. MORRISON, inspectors.

COMPLETED SAND-ASPHALT surfacing *(left)* supported at sides by creosoted plank.

John D. Waldrop, as state highway engineer of North Carolina, had charge of the location and construction of the project. J. C. Gardner is engineer of the first district in which the project is located. Neely J. Cromer was resident engineer in charge. Plans for this project and for the ultimate extension of a highway the entire length of the 150-mile barrier beach were conceived by Frank C. Kulger, member of the North Carolina State Highway Commission from the first district.

The 10.7-mile section of sand asphalt was laid under contract by Robert G. Lassiter & Co., of Raleigh, N. C., with J. R. Love as superintendent in charge.

Seattle Bridge Floor Paved With

ARMORED ASPHALT

AN OPEN mesh mat of steel bars, fabricated in interlocking sections and filled with a sheet asphalt mixture, forms the roadway surface of the new West Spokane St. double-leaf bascule bridge at Seattle, Wash. The bridge has a creosoted plank deck to which the steel mat sections are fastened through clips by means of $\frac{5}{16}$x3-in. drive screws. A layer of galvanized sheet iron is introduced to protect the asphalt from any possible chemical action from the creosote of the deck planking.

The steel pavement sections, as manufactured by the Irving Iron Works Co., of Long Island City, N. Y., consist of a series of $1\frac{1}{4}$x$\frac{3}{16}$-in. straight bars riveted to alternating crimped bars of the same size, to produce an open mesh mat. The individual steel paving sections are tied together by interlocking splices and a wearing surface of sheet asphalt is applied and rolled in to fill the open spaces between the steel bars.

The installation was made under the supervision of the city's bridge department by the General Construction Co., of Seattle, and is claimed to be the first of its type in regular service.

STEEL MESH SECTIONS, with interlocking splices, are anchored to plank decking of bridge and filled with a sheet asphalt mixture to produce non-skid waterproof riding surface.

FULL-REVOLVING 8-YD. STEAM SHOVEL, mounted on wheel trucks, loads 30-yd. air-dump cars with blasted shale on Bald Knob.

8-YD. SHOVELS REMOVE HILLTOP

to Make Terminal Fill

A SKILLFUL organization, ably directed, and ample equipment, efficiently operated, are making satisfying progress on a borrow-and-fill job, amounting to almost 5,500,000 yd., for the new Cincinnati union passenger terminal. To obtain material for a fill up to 55 ft. deep, covering an area 1,200 ft. wide and 1½ miles long, Winston Bros. Co., of Minneapolis, Minn., is removing more than 3,000,000 yd. of rock, clay and shale from Bald Knob, about ½ mile from the terminal site, and is digging more than 1,000,000 yd. of sand and gravel from a deposit 15 miles away. Large steam shovels and extensive railway equipment are moving the material at a rapid rate.

To provide a union passenger station and terminal for the seven trunk-line railroads entering the city, the Cincinnati Union Terminal Co. bought a 200-acre site to the west of the business section, on the east side of Mill Creek. The site was partly taken up by railroad and industrial properties and was largely given over to dumps and water holes. It was decided to raise the area 1 ft. above the maximum recorded Ohio River flood. This decision called for a fill of more than 5,000,000 yd., up to 55 ft. in depth.

Bald Knob is a steep hill to the west of Mill Creek, rising more than 200 ft. above the grade of the terminal. Trains from Bald Knob are moved to the terminal area over the tracks of the Chesapeake & Ohio's Chicago line. Gravel for certain parts of the fill which require uniform settlement of material comes from a pit along the same railroad line, about 15 miles from the terminal.

Plan of Bald Knob Operation—Winston Bros. Co. established a railroad yard, shop, and camp near the base of Bald Knob, along the Chesapeake & Ohio. Bald Knob rises more than 160 ft. above this yard, to El. 815. To obtain the required amount of ma-

EQUIPMENT ON BALD KNOB. Electric well drills sink blasting holes ahead of shovels. Two 8-yd. steam shovels load most of material, and two 1¼-yd. machines perform railroad benching and clean-up work. Contractor also uses two 1¼-yd. shovels for loading.

terial, the contractor planned to cut around the hill on an ascending spiral and, after taking the shovels to the top, to level the hill to El. 675.

Material in the hill consists of hard shale with thin strata of limestone; all of it has to be blasted. The contractor recognized that caution in blasting would be necessary, as the operations are within the city limits. City and court authorities, however, imposed unusually drastic restrictions requiring extremely light loading and the shooting of only one or two holes at a time.

Five Class 29 Armstrong electric well drills, using 5⅝-in. bits, put down the holes for blasting ahead of the shovels. A rope tramway of 350-ft. average span, operated by a Lidgerwood electric three-drum hoist, has served to transport explosives up the hill to the blasting gang. The towers and tramway have been moved several times to more convenient locations as the work progressed.

Excavating Equipment—For loading the blasted rock, the contractor uses two Marion 8-yd. steam shovels of the full-revolving type, each mounted on four four-wheel trucks, and two Marion 1¾ yd. steam shovels mounted on crawlers. The 8-yd. shovels have 85-ft. booms and 52-ft. dipper sticks. Two smaller shovels, a Marion 1¼-yd. gasoline-electric and a Northwest 1¼-yd. gasoline, do cutting and benching for the railroad track and clean up spillage. Both the 8-yd. shovels have seen service on the iron ranges.

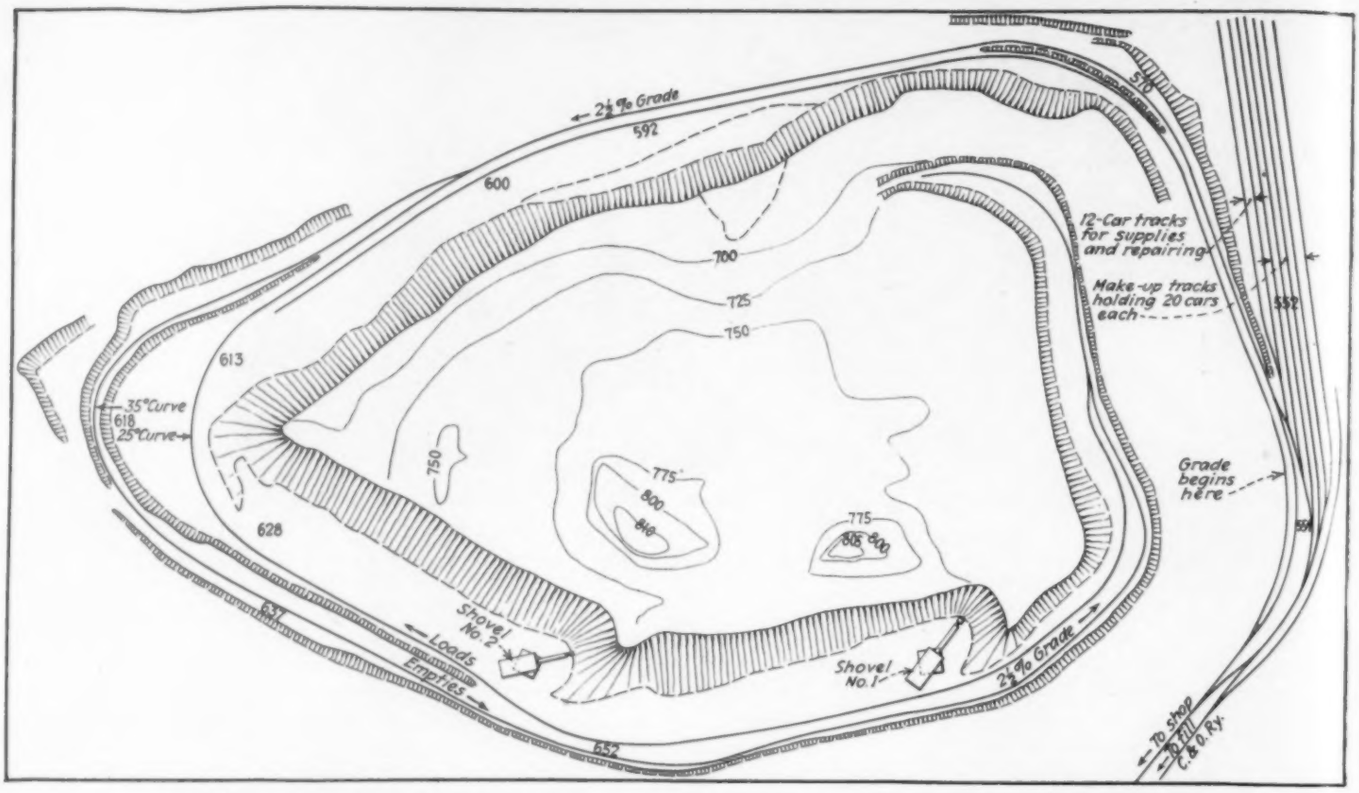
Operations on Bald Knob were planned to keep the two largest shovels operating at capacity. Practically all loading is done on a one-way track which parallels the cut, a passing track being provided to prevent delay in bringing in empty cars. By double-shifting both shovels (two 10-hour shifts), the contractor has loaded at least 300 30-yd. cars a day. The limit of production has been 360 to 375 cars in 24 hours.

Spiral Cut—For the purposes of this article, we shall designate the two 8-yd. shovels as No. 1 and No. 2. In making the ascending spiral cut around the hill, Shovel No. 1 worked about 200 yd. ahead of Shovel No. 2, both loading on to the same track, as indicated by the accompanying plan. Average trains consisted of seven cars each. When starting work in the morning, a train of empty cars was waiting at each shovel. After Shovel No. 1 had filled three or four cars, its train dropped down the track to wait for Shovel No. 2 to load the other cars. Each succeeding train was loaded in the same way by both shovels. By maintaining approximately the leeway established in the morning to allow for possible differences in loading speed, both shovels operated without interruption through the day.

The loading track alongside Shovel No. 1 was about 6 ft. above the grade of the cut. To permit loading by Shovel No. 2, the track had to be shifted in upon the grade excavated by Shovel No. 1. Shovel No. 2 cut about 6-ft. below the level of Shovel No. 1 in order to maintain equal loading efficiency.

The most efficient dumping height for the 8-yd. shovels, with dipper stick horizontal, is about 25 ft. above cut level. It was impossible to establish this loading height in the ascending sidehill cut. After the two shovels had started to level the top of the hill,

COMPOUND MALLET LOCOMOTIVE at front end, and similar locomotive at rear, move 35-car gravel train over C. & O. track from borrow pit to terminal fill.



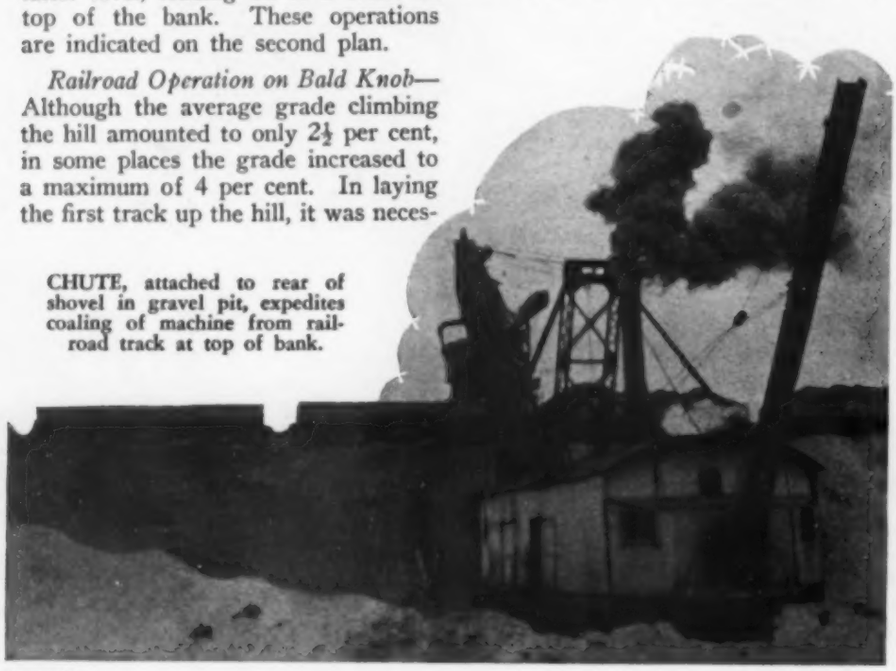
PLAN OF BALD KNOB OPERATION, as shovels make ascending spiral cut from El. 554 to top of hill.

Shovel No. 2 was able to load on to a track at the top of its bank.

Leveling Top of Hill—After Shovel No. 1 had reached El. 715, it made a horizontal cut along the west side of the hill and continued working back and forth along this side, going deeper at each cut in order to keep a few feet below the loading track. Shovel No. 2 turned at El. 695, and, after working down to El. 675, began cutting the north and west sides of the hill to the latter level, loading on to a track on top of the bank. These operations are indicated on the second plan.

Railroad Operation on Bald Knob—Although the average grade climbing the hill amounted to only 2½ per cent, in some places the grade increased to a maximum of 4 per cent. In laying the first track up the hill, it was necessary to use one curve of 40 deg. After operations had advanced sufficiently, the maximum curvatures were reduced to 35 and 25 deg.

Six Baldwin 80-ton six-wheel locomotives handle seven-car trains on the hill. The locomotives push the cars up the hill and back down, controlling the speed of descent by braking. As a safety measure, the brakeman riding the front car on a train going up the hill has under his control a safety valve for applying the air brakes. Since the shovels began the leveling operation at the top of the hill, both loaded and empty trains have used the same track. The switch men at the top of the hill have a clear view of the yard, and they can send trains down at times when no empties are starting up. Loaded trains are delivered to the yard to be made up for movement over the C. & O. main line to the fill.



CHUTE, attached to rear of shovel in gravel pit, expedites coaling of machine from railroad track at top of bank.

The yard has five tracks of 20-car capacity for making up trains and two 12-car tracks for unloading supplies and making repairs. Trains of 14 to 22 cars are hauled from the yard over the C. & O. track by an American 80-ton six-wheel locomotive which delivers them to a yard consisting of three 25-car tracks on the fill. This yard has been moved as filling progressed.

The C. & O. track drops on a fairly steep grade from Bald Knob to the fill. Winston Bros. trains back down to the fill, and the locomotive pushes the empty cars up the grade. Two brakemen are carried, one on the locomotive and another on the end car.

A C. & O. operator has charge of the switch at each end of the section of main-line track used by the contractor's trains. The operators are in telephone communication with the towers at both ends of the block in which the section is situated. Heavy traffic over the main line makes careful operation necessary. Orders must be received from the towers before a dump train

can be switched on to the line. The semaphores at the yard switches are tower-controlled.

Gravel Borrow Pit—At Mile Post 16 on the C. & O. Chicago line, between the track and the Miami river, the terminal company obtained an excellent gravel deposit to provide fill material under shops and buildings which are to be constructed. The deposit selected covers a level area to great depth. Winston Bros. Co. is digging and loading gravel with a full-revolving Marion 8-yd. steam shovel, on wheel trucks. The shovel is making a cut about 30-ft. deep and is loading on to a track on top of the bank. Operations started on the river side of the site, and successive cuts, which parallel the C. & O. track, are working toward the railroad.

Track is laid out to insure continuous shovel operation. The loading track and the passing track connect with a ladder track leading to the lower end of the make-up yard. As the shovel reaches the end of one cut, the loading track is removed, and the passing track becomes the loading track for the next cut. A new passing track, already laid, serves to bring in empty cars to the shovel immediately.

Two 55-ton Porter steam locomotives move the trains at the borrow pit and make up trains of 35 loaded cars on the tracks of the yard. Because of the long haul to the fill, the contractor has use for 114 Western 30-yd. air-dump drop-door cars. The cars can be loaded to hold 34 yd. or more of gravel.

8-YD. DIPPER bulldozes spillage from alongside loading track at gravel pit.

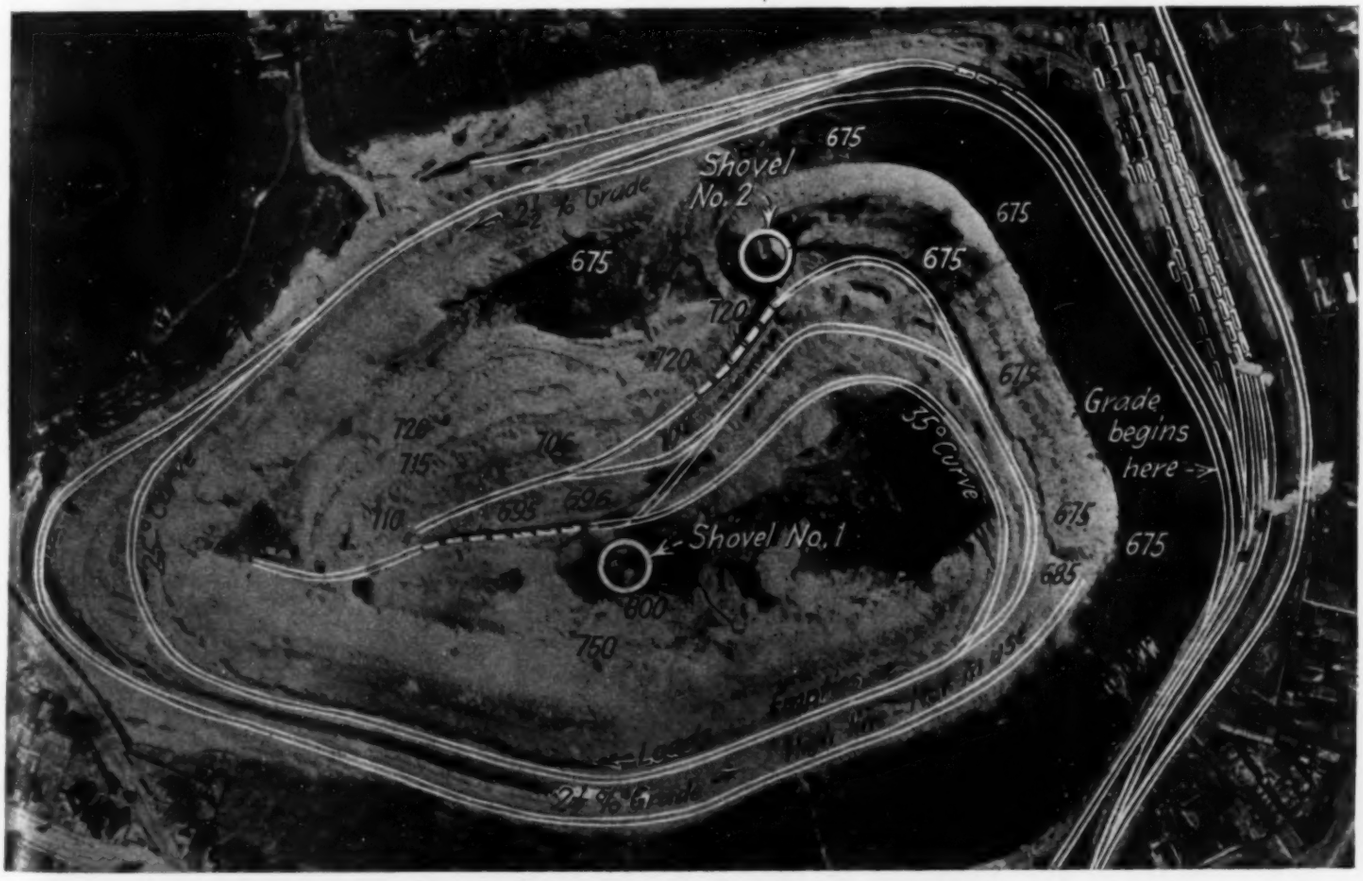
The Chesapeake & Ohio hauls the 35-car trains from the gravel pit to the terminal. Two compound Mallet locomotives are needed to move the heavy trains up the 1.7 per cent grade from the Miami river.

Running two 10-hour shifts at the borrow pit at Mile Post 16, Winston Bros. Co. loads 250 or more cars a day. The limiting factor in the output is the supply of empty cars. Delay in main-line deliveries sometimes causes interruptions in loading.

Dumping Operations—From the yard on the fill, cars are taken to the dump in trains of 15 or less, depending upon the length of the dump. One or two 80-ton locomotives handle all trains on the fill.

Jordan spreaders level the dumped material, and Nordberg mechanical shifters are used to move the tracks. The track shifters prove particularly effective in wet weather, when the disintegrated shale in the fill becomes so heavy that it would be practically impossible to move tracks by jacking. A Caterpillar 60-hp. tractor equipped with bulldozer has been used for spreading material on certain portions of the fill.

Administration—J. C. Agnew is in charge of operations for Winston Bros. Co. The design and construction of the terminal are under the general direction of Henry M. Waite, chief engineer. George P. Stowitts is engineer of construction, and John M. Belknap is district engineer in charge of grading.

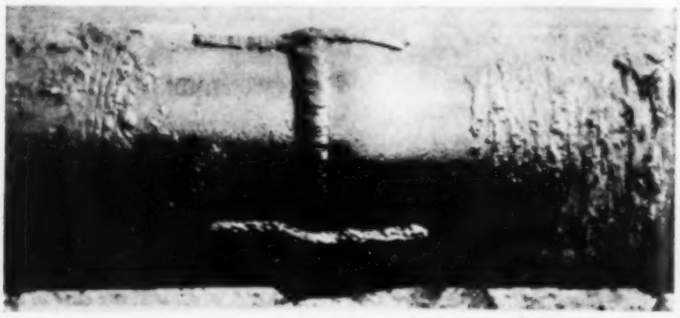


SHOVELS LEVEL TOP OF BALD KNOB. Machine No. 2 is working at final elevation, loading cars on bank 45 ft. above pit level. As indicated by track layout, Shovel No. 1 has worked back and forth, advancing into summit of hill.

Getting Down to DETAILS

Close-up Shots of
Job Methods and Equipment

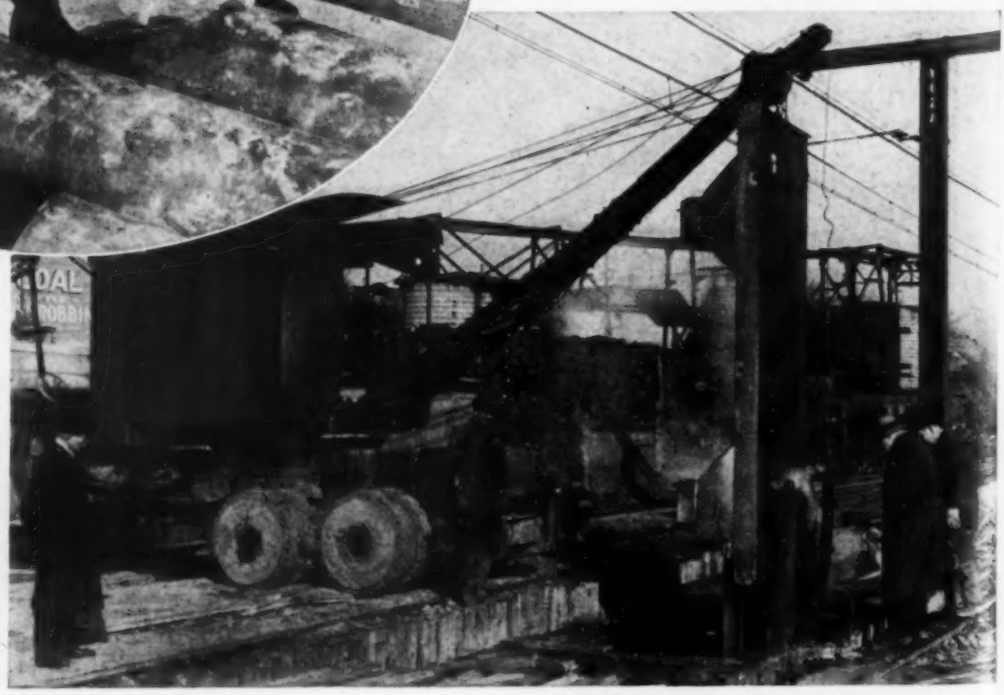
CHICAGO BOOM, 90 ft. long, sets portico stone for R. F. Jones Co., contractor, on Horace Bushnell Memorial Hall, Hartford, Conn.



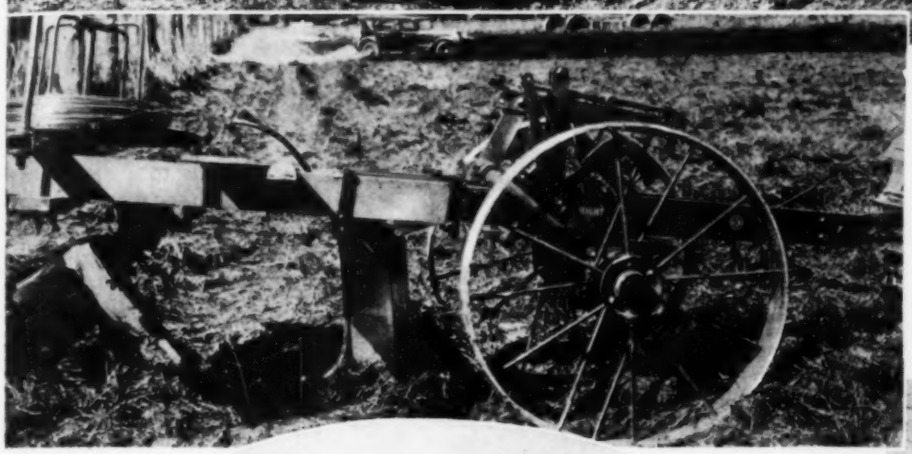
FOUR REINFORCING STRAPS, electrically welded by Lincoln stable-arc machine, strengthen 12-in. bell-and-spigot oil pipe joint at river crossings of Texas-Empire line.

CAST-IRON POINTS *(above)* aid Industrial Construction Co. in driving 18-in. diameter pile casings in 10-ft. lengths to depths of 55 ft. for Big Four bridge substructure in Cleveland.

BABBITT METAL LADLE with twin lips made entirely by welding with Linde oxy-acetylene equipment. Bottom-feed holes allow pouring of molten metal free from slag.



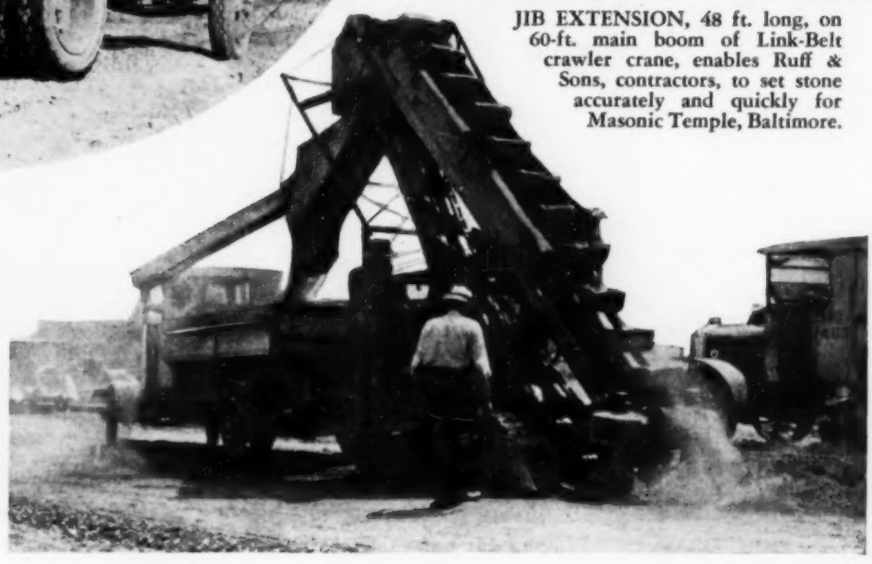
MOBILE PILE-DRIVING RIG *(right)*, on Industrial Construction Co.'s Big Four bridge foundation job in Cleveland, consists of Browning crane on Mack truck chassis carrying McKiernan-Terry hammer in 12-ft. leads. Passing trains necessitated frequent moves of outfit.



UNDERGROUND WIRE, aggregating 32 miles in length, for radio station in Oregon, is laid at 2-ft. depth by Killefer subsoiler hauled by Caterpillar tractor *(above and at right)*. Wire carried on reel is threaded through pipe attached to subsoiler blade.

FOR HANDLING BULK CEMENT *(above)*, on a 16-mile Pennsylvania state highway contract, special bodies were designed for the delivery trucks to permit the weighed amount of bulk cement for each batch to be carried to the mixer in separate compartments (along left side of truck body) without coming in contact with the sand and gravel.

JIB EXTENSION, 48 ft. long, on 60-ft. main boom of Link-Belt crawler crane, enables Ruff & Sons, contractors, to set stone accurately and quickly for Masonic Temple, Baltimore.



WORN MATERIAL *(right)* is removed from surface of Ohio highway by Barber-Greene bucket loader with discharge chute equipped with screen. Coarse pieces drop back upon the road, while fine material drops into body of motor truck for removal.

Temple of UNIQUE DESIGN *Taxes Ingenuity of* FORM BUILDERS

A NEW architectural conception by the late Louis Bourgeois for the Baha'i Temple at Wilmette, Ill., near Chicago, presented a number of interesting problems to the builders of the unique, pleasing edifice. A steel and reinforced-concrete building of unusual shape, enclosed mostly by glass and surmounted by a glass dome, with a multitude of curved and warped surfaces in its concrete details, the temple called for high skill on the part of the George A. Fuller Co., general contractor, and 24 subcontractors, in solving the intricacies of its construction. At present, only the bare superstructure is completed. As funds become available, the building will be clothed, inside and out, with surface ornament of rare beauty, which will cover the concrete with other material and will conceal the glass with richly designed metal grilles.

Foundation work for the Baha'i temple was performed in 1921 and 1922. The main support of the foundation consists of nine concrete caissons which were sunk to rock at a depth of 120 ft. below the ground surface at the site. Considerable difficulty was experienced in sinking two of these caissons on account of a strong flow of water, which was not indicated by the original test borings. These caissons serve as the direct support for the nine groups of structural

GLASS DOME surmounting nine-sided building forms roof of central auditorium with clear height of 138 ft.

steel and concrete columns which support the dome at an elevation of 135 ft. above the main floor level.

The foundation structure resting on the nine caissons and additional concrete piles consists of a reinforced-concrete circular building 202 ft. in outside diameter. This circular building contains a central auditorium, with a domed ceiling, having a seating capacity of about 450 people. Outside the central hall are located the operating equipment for the heating, lighting, and ventilating systems, storage spaces, toilet rooms, cloak rooms, kitchen, and serving room. Space is also provided for the future installation of library, archives, and reading rooms.

The building, as now completed, consists of four main divisions or stories. The base portion at the first floor is 36 ft. high and 150 ft. in diameter. It includes a circular hall 72 ft. in diameter extending for a clear height of 138 ft. to the interior of the dome. Around this circular hall are nine smaller rooms or chapels, with a main entrance between each pair of rooms. A unique feature of the building is its shape, having nine sides with a pylon at the intersection of each pair of sides or faces.

Above the main story is the first gallery, also nine-sided, but with the corner pylons at the middle of the faces of the main story, that is, over each of the nine doorways. This first gallery floor has a height of 47 ft. and an approximate diameter of 136 ft. Above the first gallery is the second gallery story which has a height of 20 ft. and a diameter of 93 ft.

Above this story rises the dome which forms the roof of the central circular hall. The dome is a unique structure in that it consists of two separate and independent structural steel frames of lattice girders thoroughly crossed-braced. On the upper chords of the inner structural framework is supported an especially designed aluminum-and-glass dome. The structural framework of this dome consists of aluminum channel and angle sections which support the panels of wire glass. Joints were designed to be waterproof and to provide complete drainage for leakage and condensation. Special attention was given to ease of replacement of any glass sections which might become broken. The outer dome framework will support the exterior ornamental artificial stone which forms the essential design of the dome and which will be applied later. Provision is made for reaching any part of the dome by means of ladders and catwalks. At the base of the dome outlets are placed at three equally distant locations to furnish steam, water, compressed air and vacuum for the cleaning and maintenance of the dome structure.

INTERIOR OF CENTRAL HALL AND DOME. Auditorium has two galleries. Wire glass panels of dome rest on aluminum sections supported by steel lattice girders.

For the present only one of the nine entrances to the building will be used. This provision is made necessary by the fact that with the available funds, it was impossible to build the eighteen circular steps on the foundation structure; these must form a part of the surface ornamental material to be placed in the future. The beautiful arched window spaces are enclosed with heavy glass set in frames and sash of non-corrosive material.

On the foundation, erection of the superstructure began in September, 1930. A principal feature of this work was the erection of the structural steel, supplied by Worden-Allen Co., of Milwaukee, Wis., and erected by the Overland Construction Co., of Chicago. As shown by the accompanying photographs, the structural steel for the first story was erected with the derrick placed on the top of the foundation structure at the main floor level. The steel of the first gallery story was subsequently placed by the derrick supported on a heavy timber tower at a higher elevation. The derrick was then raised and used to erect the steel of the second gallery story and the major part of the dome. The enclosure of

the dome was effected by a secondary boom applied to the main boom of the derrick.

Curved lines and warped surfaces appear in nearly every part of the structure. The masonry contractor found the framework an interesting and somewhat difficult problem. A templet was laid out on the first floor to determine accurately the location of the corner pylons and the proper size and curvature of the first story arches. This templet then was transferred to a level plot on the ground near the formwork benches, and the arches were built up from the templet. One of the accompanying illustrations shows the arches built up and ready for transfer to their places in the structure.

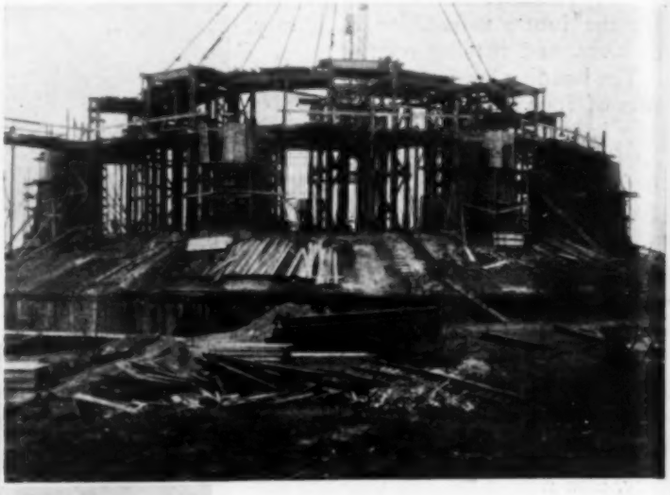
Unusual care was taken in proportioning, mixing, and placing the concrete, with the purpose of obtaining a high-grade result, both in density and the surface finish. The placing of concrete in the window mullions and piers was difficult, as these parts of the structure varied from 30 to 47 ft. in height and in some cases had a width of about 4 in. Workmen vibrated the forms with rubber mallets in order to obtain maximum density and uniform texture.

Concrete was designed for a minimum strength of 2,500 lb. per square inch. An inspector on the job watched all concrete work. Slump tests were made to determine the workability of the mixture, and compression tests were made for 7 and 28 days throughout the project. The average 28-day compression-test result was about 2,900 lb. per square inch, and the average of the 7-day tests was about 1,500 lb. per square inch. Two test cylinders were made daily; one for 7 days (job control) and the second for 28 days (standard).

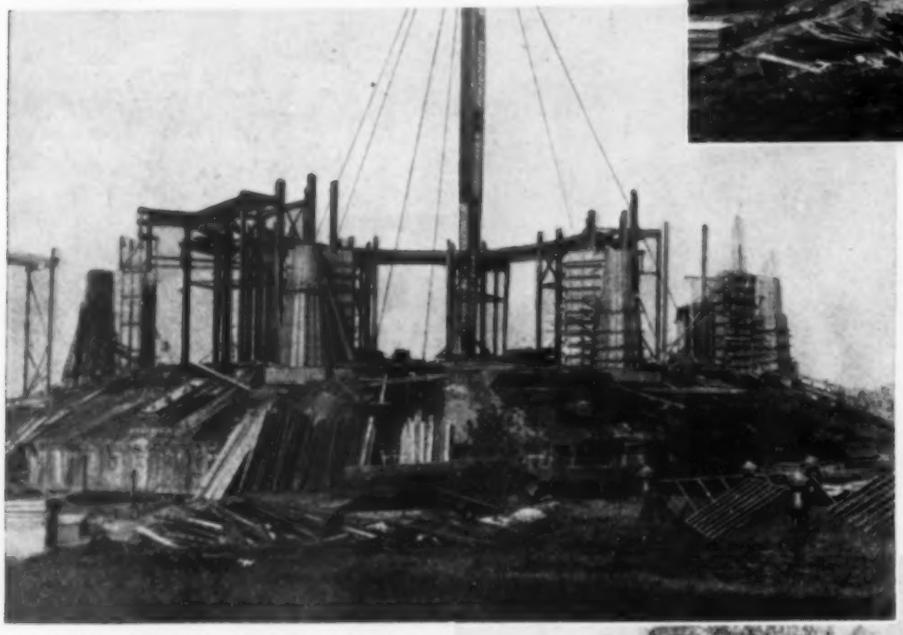
An unusually mild winter aided in maintaining remarkable progress on the construction. Favorable weather conditions also made it possible to obtain a high quality of concrete masonry. Only one accident occurred to mar the job record.

In the early morning of Jan. 15, 1931, a fire broke out in a second story space which was being heated to protect the concrete while it was setting under low-temperature conditions. Driven by a high wind, the fire spread over several bays of the second gallery story and destroyed a platform which was suspended at the base of the dome, putting the concrete masonry to a severe test. Careful inspection made by experts after the fire indicated that, aside from the blackening of the face of the masonry and some slight spalling of the concrete, no real structural damage was done. The loss was covered by insurance.

The late Louis Bourgeois, of Wilmette, was architect of the temple, and Benjamin B. Shapiro, of Chicago, was structural engineer. The Research Service, Inc., Washington, D. C., acted as managing and supervising engineer for the temple trustees; A. B. McDaniel secretary of that organization, supplied the photographs and data for the foregoing article.



STRUCTURAL STEEL *(right)* **to first gallery level is erected by guy derrick set on floor.**

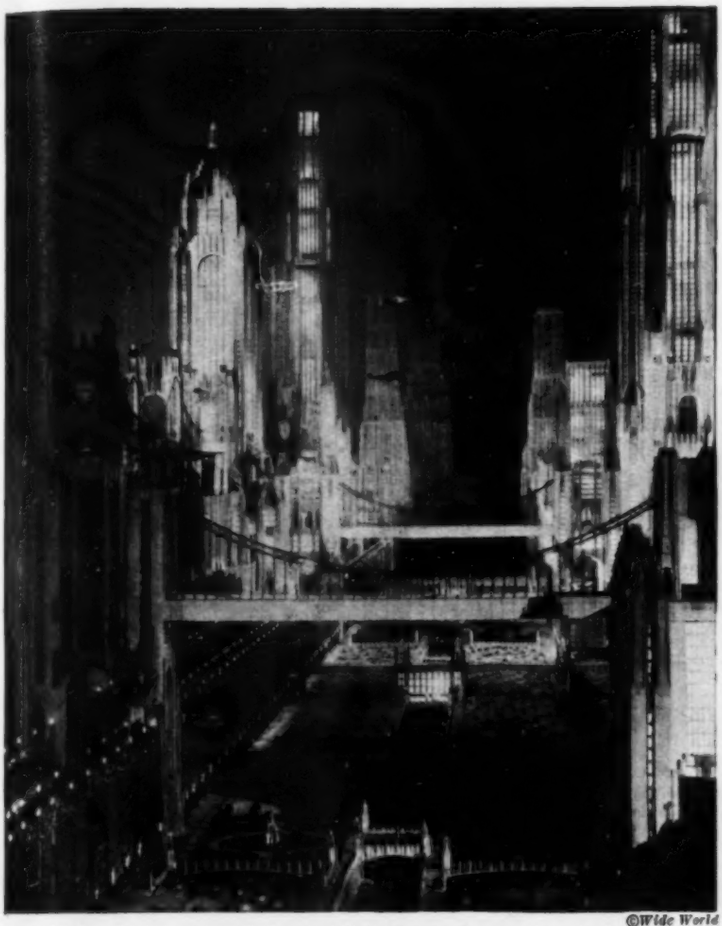


NINE GROUPS of steel and reinforced concrete columns form pylons at intersections of nine sides.

ARCH FORMS, built from templet made on job, are ready for use.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction



©Wide World

CITY OF THE FUTURE. Multiple levels for traffic, airplane and dirigible landings, bridged crossings between skyscrapers are a few of the conceptions of the art director for the Fox motion picture, "Just Imagine."

©Rotofoto

GROOVED RUNWAYS to keep traffic in line on new upper deck roadway of Queensboro bridge drew storm of protest from motorists. Vertical sides of slots were later beveled to prevent damage to tires.

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"GRAPEVINE" HIGHWAY *(left)* introduces series of curves in popular route between Los Angeles and San Francisco.

©P.A.A.

GERMAN PAVING TAMPER *(right)*, operated mechanically, compacts surfacing on street in Berlin. Note operator's knee pads.

Step-by-Step

I—Invisible Patches for Concrete Pavements

OPENINGS in concrete pavements are easily placed without defacing the surface of the pavement. Patches properly made will have the same serviceable, long life as the original pavement. Such repairs can be made with a minimum of inconvenience to traffic. The complete operations for such repair are illustrated and described. Only a few inexpensive tools are required.

In residential sections the appearance of the street is of much concern to the residents. Unsightly patches are never necessary. By following the few simple rules necessary for best results in concrete work, concrete patches may be made to blend with the pavement.

1 TRIMMING to insure square edge at least 1 in. deep below surface of pavement. Subgrade, too, should be dug out to allow patch to extend under main slab.

2 HAND MIXING of concrete economical where small areas are involved. To permit early opening for traffic, richer mixes with minimum amount of mixing water should be used.

3 SPRINKLING EDGES of pavement. This insures a good bond between old and new concrete. All dirt and loose material should be carefully cleaned out and hole wetted.

4 PLACING CONCRETE. Use same aggregates and proportions as in original pavement. Minimum amount of mixing water should be used. When necessary to open patch for traffic in 24 hours, mix cement-water paste, using 4 gal. of water for each sack of cement. Add sand and stone to this paste until desired consistency and workability are obtained.

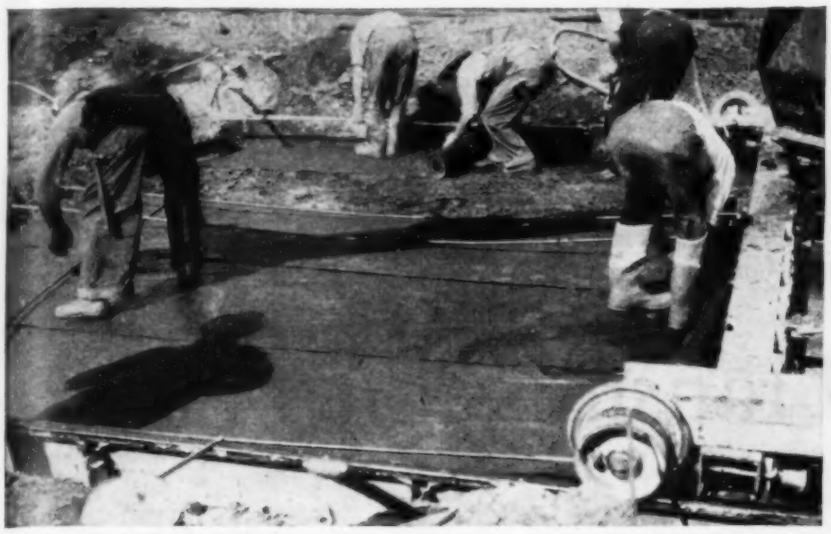
5 HAND TAMPING, and plenty of it, makes a good patch. Concrete shrinks slightly as it hardens, and this shrinkage must be taken up by tamping while the concrete is hardening; otherwise, a fine crack will appear between new and old concrete. Tamp concrete firmly against sides and bottom so that no cavities are left. Repeat tamping at least three times at intervals of 5 or 10 min.

6 FINISHING. After tamping, strike off patch with straightedge which rests on old concrete and finish with a wood float. The hole must be filled a little more than full at first to allow for compaction due to tamping.

7 OUTLINE OF PATCH indicated by crosses. Damp burlap was kept on this patch over night. Then it was opened to traffic. Curing in this way is final precaution for obtaining an invisible patch.

Field Methods

II—Construction Details on Iowa Paving Job



1 COVERING THE SUBGRADE with tar paper to prevent absorption of water from concrete. This is standard practice in Iowa for 1931. Contractor, Star Coal & Improvement Co., Davenport, Ia.

2 PREMOLDED EXPANSION JOINT MATERIAL installed against bulkhead and temporarily capped with metal channel. Dowels across expansion joints are capped with tin sleeves.

3 HAND DEVICE for cutting groove along center line is attached to bridge used in longitudinal floating. WHEEL is lowered to cutting position and groove, thus made, is filled with narrow strip of premolded expansion material.

4 STRAIGHT-EDGE ON LONG HANDLE scrapes from surface excess mortar following consolidating and longitudinal floating.

5 STEEL CHANNELS are bolted to forms to serve as forms for lip curb after pavement has been finished.

6 METAL FLOAT that rests on backform and gutter shapes curb face. Concrete for curb is carried back from mixer in coal scuttles.

Pipe-Line Men Improve Methods of Constructing

PREPARING FOR RIVER CROSSING, 10-in. pipe is welded into 200-ft. sections on river bank.

Large Gas Transmission Mains

Part III

A Multiple-Main River Crossing

SUBMERGED river crossings constitute a special division of pipe line construction. Both the design of the pipe line and the methods of construction must be changed at the crossings of large streams. A good example of the conditions and operations involved in this work is afforded by the Missouri River crossing of the Continental Construction Co.'s 24-in. main. As usual at a river crossing, the large main was converted into a number of small pipes for the subaqueous portion of the line. Of greater interest was the fact that Smith Bros., Inc., of Dallas, Tex., employed three methods of constructing the subaqueous mains, finally perfecting a procedure which proved satisfactory.

CLAMP *(above)* holds joint of 10-in. pipe for tack-welding at four points. As no chill dam is used inside pipe of this diameter, pipe ends are spaced with ¼-in. welding rod and are clamped in position. GIRTH JOINT *(below)* is oxyacetylene welded.

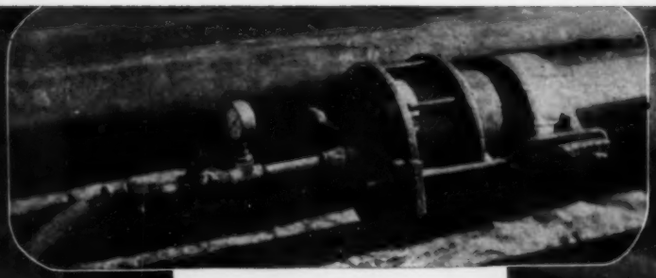
Description of River Crossing—The submerged portion of the river crossing, approximately 1,500 ft. in length, consists of two batteries of five 10-in. pipes. Each battery connects with an 18-in. main, which extends across the lowlands adjacent to the river. The two 18-in. pipes merge into the 24-in. main.

On the west, or Nebraska, bank, the 18-in. mains are approximately 1,000 ft. long; on the east, or Iowa side, the 18-in. pipes are about 17,300 ft. in length. The ten 10-in. pipes extend about 400 ft. beyond the water on the west side, and about 2,000 ft. on the east. Thus, the headers of the 24-in. main are about 22,200 ft. apart.

Extra capacity is provided in the river crossing in order that a damaged pipe or pipes may be cut out of service in case of a break, without affecting operation of the line. A valve arrangement makes it posible to cut out pipes as desired. To prevent tensile stress from being exerted upon the pipe by action of the river current and shifting of the river bottom, the mains are bowed upstream. The movement of the river bottom thus tends to put the pipe in compression.

Between the 18-in. headers of the 24-in. main, all joints are oxyacetylene

INSPECTOR APPLIES SOAPSUDS to welded joint to test it for leaks under 100-lb. air pressure.



PIPE IS CAPPED for tests under 100-lb. air pressure after five 40-ft. lengths have been welded into 200-ft. section.

FOUR STEEL STRAPS, ¼x2x10 in., are electrically welded to each joint of 10-in. pipe.

welded and are reinforced with longitudinal tension straps welded on electrically. Electric welding was specified for the longitudinal reinforcement plates because it causes less burning of the pipe metal. Both 18-in. and 10-in. mains are weighted with cast-iron river clamps to overcome buoyancy.

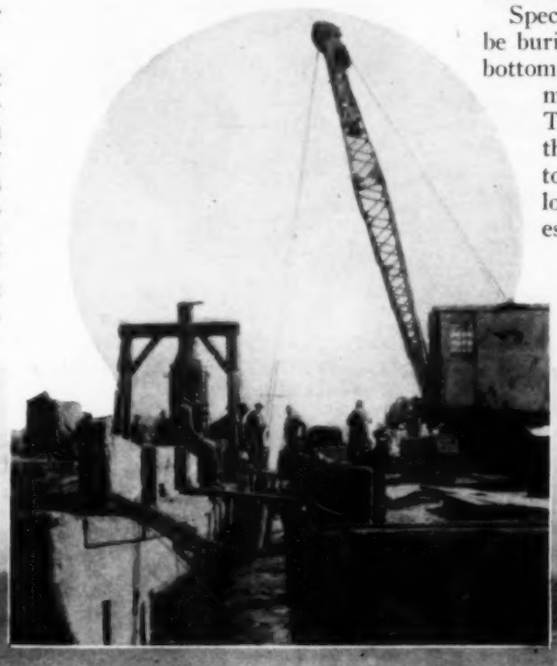
Preliminary Operations — Except for the addition of the electrically-welded longitudinal straps (six at each joint) and of the cast-iron river clamps, construction of the 18-in. mains across the bottom lands was very similar to work on the 24-in. line described in the two preceding installments of this series. The operations of greatest interest were those involved in the construction of the ten subaqueous mains.

In preparation for the submersion of these mains, the contractor aligned and welded 200-ft. sections containing five 40-ft. lengths of 10-in. seamless tubing. The pipe was beveled 45 deg. at the joint to receive the welding metal.

After several sections had been completed, an inspector subjected the joints to a soapsuds test under 100-lb. air pressure. The pipe was painted and the river clamps were bolted on in readiness for placing operations.

Specifications required that the pipe be buried at least 4 ft. below the river bottom and not less than 8 ft. below mean low water at all points. The river is 16 to 18 ft. deep in the channel, making it necessary to place the pipe 20 to 22 ft. below mean low water at the deepest part of the crossing.

Three 8-in. suction dredges excavated the trenches for the subaqueous mains. Where



SECOND METHOD *(right, above)* of building submerged line, in two sections. One end of line is floated from each shore, rest of pipe being skidded over river bottom, and two ends are welded together near center of channel.

FIRST METHOD *(right)* of placing pipe is to float it on empty oil barrels as tractors push it out from shore. In foreground are sections of pipe, welded, painted, and weighted with cast-iron river clamps. River clamps weighing 1,400 lb. each are placed on 10-in. lines at every joint and midway between every two joints.

necessary, the mains were lowered into the bottom of the trench with the aid of water jets, pressure for which was supplied by two pumps mounted on a barge.

First Method of Placing Pipe—In the first attempt to place a 10-in. main, the contractor floated the line on empty barrels, extending it from the shore by welding on additional sections. Guy lines from anchors along the shore upstream held the floating pipe line in position.

It was the contractor's intention to anchor the complete floating pipe line in this way above its final position and, then, to sink it to place. Two tractors, anchored to the ground, with slow speed hoists working through two double blocks, pushed the pipe into the river. About 30 pairs of oil barrels were used to float each 100 ft. of pipe. After experimenting with about 600 ft. of line, the attempt came to an unhappy end, because of the extremely swift current of the river, and this plan of placing the pipe was abandoned.

It was difficult to pay out the cable from the shore anchorages at a rate to synchronize with the pushing of the tractor hoists. The anchorage cables lagged behind the action of the hoists, and the pipe was forced at an angle upstream, against the current. When in this position, a cable slipped and the pipe line buckled and drifted to the bank.

Second Method—The next scheme attempted was to float one end of the pipe from each side of the river, sliding the rest of the pipe on the river bottom and making a weld near the center of the channel. Although the method was slow, because of the difficulty of aligning the pipe perfectly

FOUR TRACTOR HOISTS, operating block and tackle, push pipe into river. C. C. LOVE *(left)*, inspector for Continental Construction Co.

for the center weld in the swift current of the channel, the five pipes of the south battery were connected and placed satisfactorily in this way. The lines were tested at 125-lb. pressure for 24 hours and then were extended to the 10x18-in. junction chambers.

Third Method—For the five pipes of the north battery, the contractor devised an efficient method. An entire pipe line, with the head end afloat, was pushed out from one bank until the floating end was brought to place on the opposite bank. Four tractor hoists, working over double blocks, pushed

THIRD METHOD *(left)* consists in pushing out entire length of line from one shore. Barges float head end from starting shore to opposite bank.

from one shore, and two other machines pulled toward the opposite shore. By this method, the contractor was able to pull a line 1,400 ft. long into place in about two days of 10 hours each.

The two tractors pulling toward the opposite bank bent the pipe to the proper curvature of the upstream bow. No. 1 (downstream) pipe of the battery had an upstream bow of about 150 ft. As the spacing of the five pipes of the battery at the center of the river was about 75 ft., the deflection of No. 5 pipe amounted to about 450 ft. The two pulling tractors drew each pipe along its curve in 40-ft. chords.

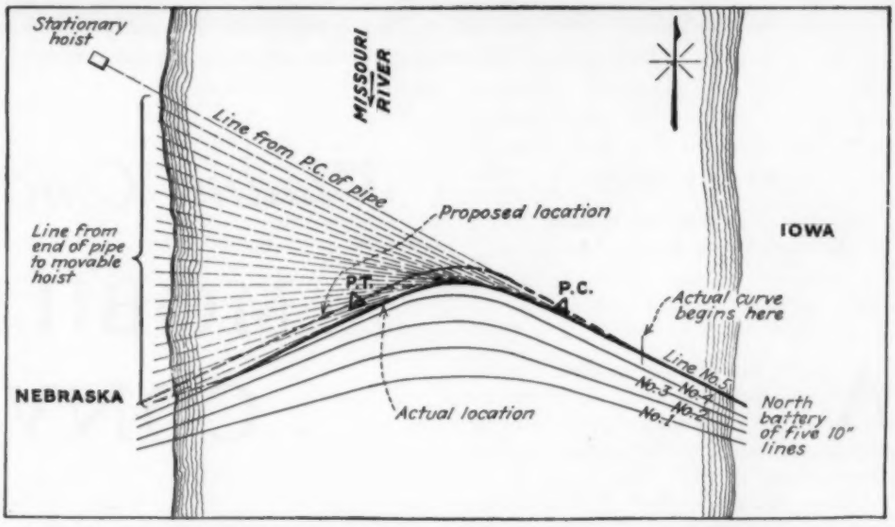
A mobile tractor had its hauling line attached to the floating end of the pipe; the line from the second tractor was connected to the pipe at the point of curvature. This second tractor was anchored in position, pulling always on the tangent. During the first part of the operation the tractor connected to the floating end also pulled on the tangent. After the floating end of the pipe had reached the point where the curving was to begin, this tractor began to bend the pipe downstream from the tangent. After each 40-ft. pull, the machine moved 40 ft. downstream. In this way it curved the pipe until the floating end reached the point of tangency, when the machine remained stationary, pulling on the tangent.

A mishap resulted from a change of plans in placing the last pipe. Because of illness, the surveyor was unable to be present to locate the point of curvature. In going ahead with the work in his absence, a mistake was made in the attempt to estimate the location of this point, and the actual curving of the pipe was begun a couple of hundred feet downstream from the proposed point of curvature. As a shortage of pipe seemed likely to develop before the last line was completed, the owner's representative decided to reduce the curve by pulling it on 20-ft. chords.

H. J. PIERCE, superintendent for Smith Bros., Inc.

By starting the curve at the wrong point of curvature and by attempting to shorten the length of the line, the constructors caused pipe No. 5 to collide with pipe No. 4, when the floating head end of No. 5 was about 160 ft. from its destination on the shore. As the four tractors continued to push and the one hooked to the point of curvature continued to pull, the line buckled at the point of curvature.

The pipe was then lifted to the surface of the water, lashed to pontoons, and moved upstream to clear line No. 4. About 40 ft. of pipe at the point of curvature was cut out, and the contractor intended to weld in a new section at once. However, a heavy flow of ice started and piled up against the barges, making it necessary to cap



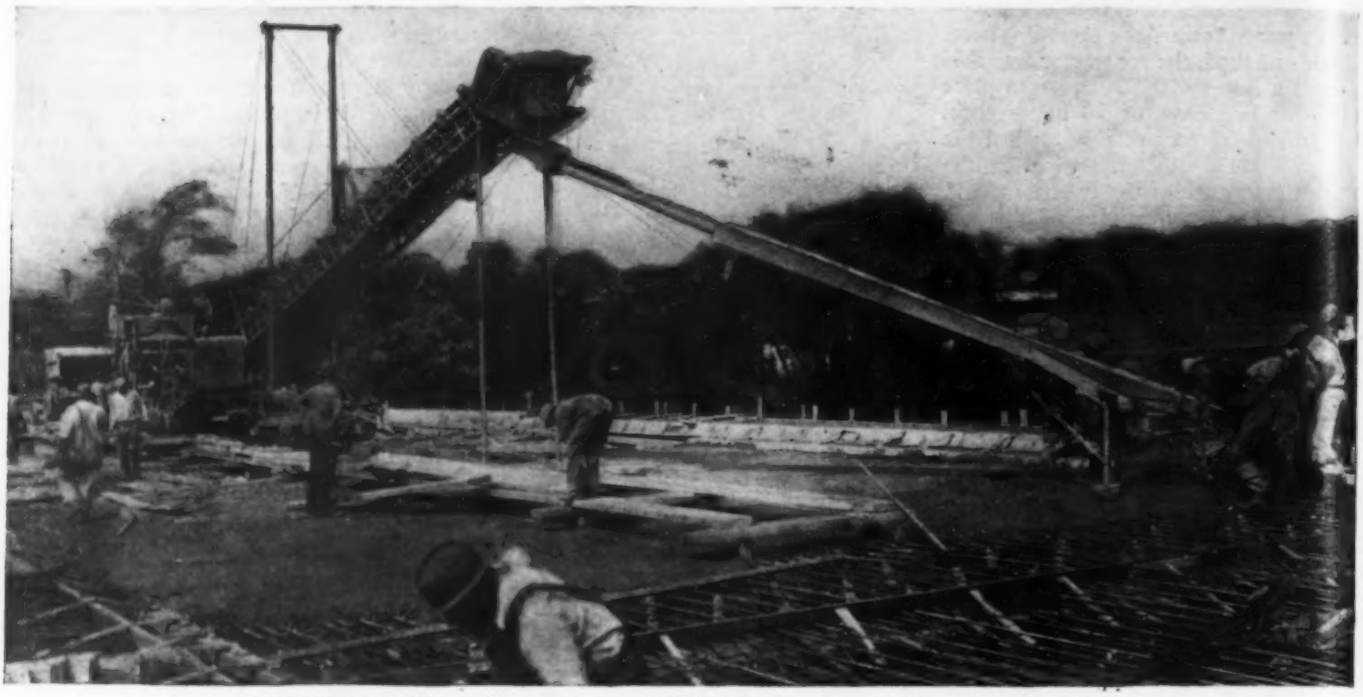
PLAN OF OPERATIONS for Line No. 5, north battery. In addition to two hoists pulling pipe to Nebraska shore, four hoists push line from Iowa side. By starting bending below proposed P. C. and by shortening curve, hoists force Line No. 5 into collision with No. 4

ALL IN A SUPERINTENDENT'S DAY. H. J. Pierce attempts to mollify an indignant lady while his dragline demolishes the only road leading to her home.

the two ends of the pipe at the point of curvature and lower them into the river before moving the barges ashore. About a month later, the crew lifted the ends of the pipe and welded the new section into the line. In that one month's time, the pipes had settled 11 ft. into the sand.

After all the 10-in. pipes had been dredged to grade, they were subjected to an 800-lb. test before being accepted.

Administration—In general charge of operations for Smith Bros., Inc., was C. S. Foreman, general superintendent, Omaha, Neb. H. J. Pierce, superintendent, and A. H. Zeitz, construction engineer, directed work in the field. C. C. Love was inspector for the Continental Construction Co. and L. R. Annett was inspector for the War Department.



PORTABLE UNIT consists of mixer and 60-ft. belt conveyor moved over plank tracks.

Viaduct Concrete Placed by MOBILE BELT CONVEYOR

By R. E. ROSS

New York District Manager
Bates & Rogers Construction Co.

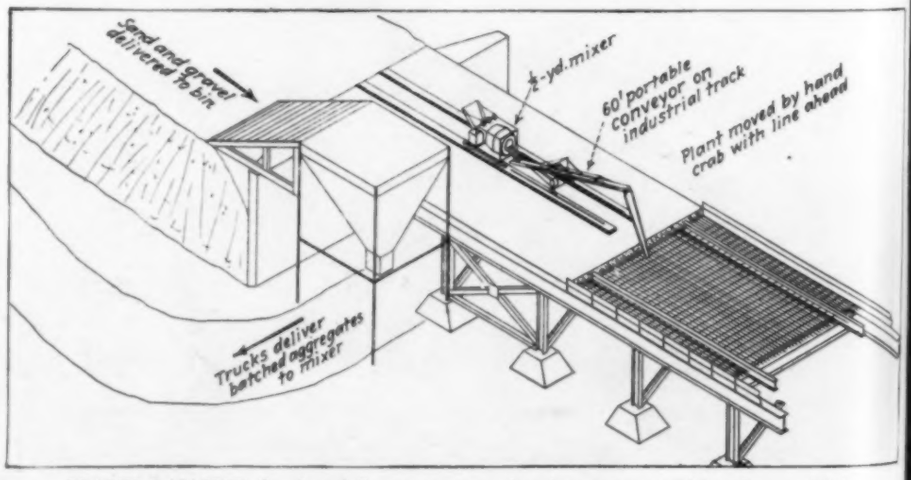
A ½-yd. mixer and a 60-ft. portable belt conveyor, mounted as a unit on a plank track, proved economical and workmanlike in the construction of the Thompson Road Viaduct, Syracuse, N. Y. The Bates & Rogers Construction Co., New York, was the contractor, for whom Ernest F. Waldman was superintendent in charge of construction.

The viaduct is the initial step in the $30,000,000 Syracuse grade separation project undertaken by the New York Central Railroad under the supervision of W. F. Jordan, principal assistant engineer. The total length of the construction, including approach embankments, is 2,500 ft. The viaduct itself is 50 ft. wide, 1,650 ft. long, 20 ft. high at each end and 50 ft. high at the center to clear the tracks of the West Shore Railroad, which crosses over the New York Central tracks at this point.

A total of 6,500 cu.yd. of concrete was required, mixed in accordance with the New York Central Railroad's new specifications, Class B, in proportions of approximately 1:2½:4½. The slump was from 3 to 6 in.

Pouring the viaduct deck presented the problem of distributing a comparatively small yardage of concrete for a considerable distance, one-half of this distance up a 4-per cent grade. Steel erection started from one end of the viaduct and proceeded to the other end; the concrete operation followed closely, so as to have the pouring finished before winter. It was not possible to start at the center and work down grade in both directions.

The contractor decided to use a belt


Sand and gravel delivered to bin
½-yd. mixer
60' portable conveyor on industrial track
Plant moved by hand crab with line ahead
Trucks deliver batched aggregates to mixer

PLANT LAYOUT developed by contractor, showing aggregate bins from which trucks delivered batches to mixer-conveyor unit on deck of viaduct.

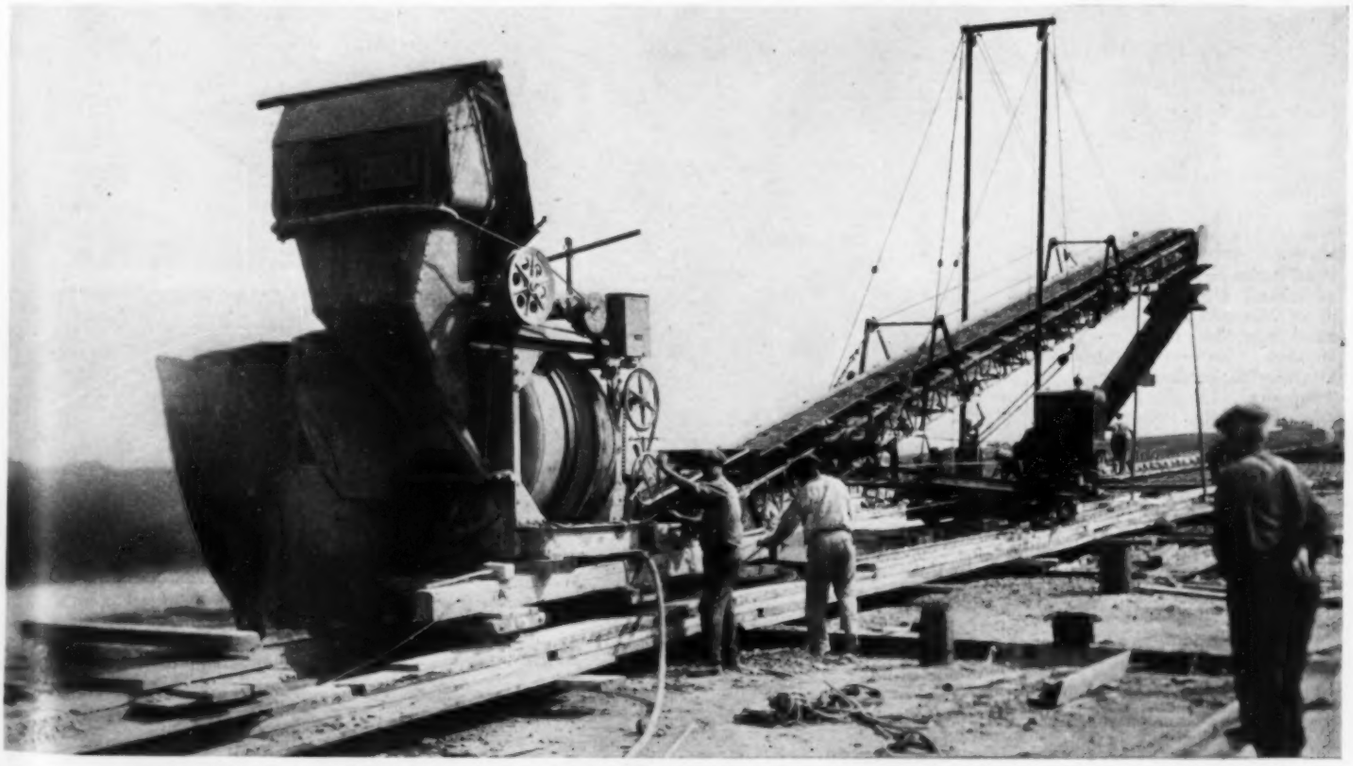
STEEL ERECTION on 50-ft. wide viaduct started from one end and proceeded toward the other for a length of 1,650 ft.

conveyor because it offered the advantages of greater ease of distribution and more rapid handling of concrete. The machine decided on was a Barber-Greene 60-ft. portable concrete conveyor with a 24-in. belt. The conveyor and mixer were mounted as a unit, the mixer on rollers and the conveyor on industrial track. The unit was rolled on a plank track supported on low horses resting on the transverse floor beams, spaced 10 ft. on centers. A hand crab, with a cable running to an anchor, made it possible for one man to move the concreting plant forward over green concrete without interfering with the pouring operation.

Swampy ground under the viaduct made delivery of material at grade difficult. A 28-yd. bin with measuring hoppers was placed in front of the north bridge abutment and concrete, sand and stone were hauled to the job in 5-yd. trucks. These trucks ran over the approach fill, backed out over the abutment on a short trestle and dumped directly into the bin. Cement was stock-piled under the bridge beside the bin.

Two-ton International trucks with two-batch pockets were loaded with 2½-yd. batches, including cement, at the bin. They then ran around the toe of the earth approach and out over the approach and bridge as far as the concrete was strong enough to hold their load, then turned around and backed out over the plank track to charge the 14-S Smith mixer. The mixer discharged on to the Barber-Greene belt, which carried the concrete to a 5-man tamping crew.

In the construction of the deck a total of 2,800 yd. of concrete was poured between Sept. 17 and Nov. 2. The average daily pour was 85 yd. and the maximum 120 yd. Had a conveyor not been used buggies and runways would have been needed to place the concrete, requiring four additional men. The use of the conveyor eliminated a wage cost item of $586 during the short time it was in operation. The cost of operation of the conveyor was approximately $322, leaving a saving of $264 effected in 40 days.



CONTRACTOR'S SOLUTION to problem of distributing small yardage of concrete over a considerable distance. Mixer on rollers and belt conveyor on industrial track are moved as unit over plank runways by hand crab.

NEW EQUIPMENT *on the Job*

PNEUMATIC TRACTOR TIRES *(left)*, replacing solid equipment on this motor grader, permit travel at higher speed over idle mileage, afford cushion for driver and protection to equipment. Also give full benefit of extra traction at lower service operating speeds. Used tractors may be converted to pneumatic equipment by providing new wheels—Firestone Tire & Rubber Co., Akron, Ohio.

REVOLVING SCRAPER *(below)* made in 4- and 5-ft. sizes, is automatic or rope controlled and operates with any type tractor. In the automatic position scraper is pulled out of bite when loaded and is raised to carrying position, thus preventing overloading, and stalling of tractor. Semi-automatic or rope control allows fast or slow loading, enables operator to determine depth of cut and amount of load, speeds up leveling and proves useful in cleaning-up jobs. Suited to road work and park, golf course and airport construction and maintenance. Farm Tools, Inc., Mansfield, Ohio.

PIPE LINE TRENCHER *(right)* excavates to a depth of 15 ft. and up to 4 ft. in width. This Parsons unit has additional three-speed transmission, thus giving three speed ranges throughout the machine. Provided with heavy-duty multiplanes with cast steel frames and self-cleaning tumblers. Extra wide conveyor belt equipped with guide clips prevents any movement of belt off center. Fuel tank, equipped with vacuum device for filling from barrel on ground without spilling. — National Equipment Corp., Milwaukee, Wis.

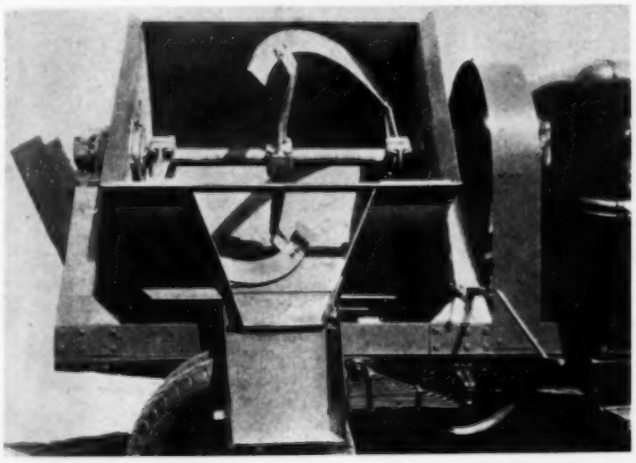
CLAMSHELL BUCKET *(right)* handles coarse broken stone and does hard excavating. Lever arm principle providing straight cable leads which reduce friction on all bearings to a minimum increases digging power. Extended corner brackets projecting beyond backs of scoops give additional closing leverage. Narrower cast-steel head provides rigid resistance to twisting strains in hardest digging. — G. H. Williams Co., Erie, Pa.

BACKFILLER-BULLDOZER *(right)* designed with strength of bulldozer and versatility of backfiller, has reversible blade pivoted on frame yoke in front of tractor and supported by struts connecting with side members which rest on track frames of tractor. Hydraulic jack, with pressure controlled by 4-way valve, actuates lifting device enabling operator to regulate cutting or spreading depth of moldboard which has 6x½-in. reversible cutting edge and can be used either as straight bulldozer or backfiller. — Davis Manufacturing Co., Davis, Calif.

SKIP-MIXER SCALE *(right)*, designed to facilitate accurate proportioning of concrete aggregates by weight, consists of all-steel welded frame and beam box in which is mounted a knife edge lever scale with swiveled arm connections. From scale levers is welded steel spider on to which skip is lowered for weighing. Scale equipped with three non-corrosive metal ingredient beams. Main section of each beam is graduated 1,500 lb. by 100 lb. and fractional part 100 lb. by 2 lb. Tare for balancing weight of skip also is provided.—Fairbanks, Morse & Co., 200 South Wabash Ave., Chicago, Ill.

HIGH PRESSURE PORTABLE TRIPLEX PUMP *(right)* for road builders and oil producing companies. Equipped with pressure control regulator, with porcelain coated removable cylinder liners or with nitrided-nitraloy removable sleeve liners which are abrasion and friction resisting. Stainless steel rust-proof plunger rods and bronze pistons. Two sizes: R-80 with displacement of 80 to 100 g.p.m. and R-125 with displacement of 104 to 125 g.p.m.; suction and discharge, 3 in.—Domestic Engine & Pump Co., Shippensburg, Pa.

WELDED PIPE FITTINGS *(below)* for branch connections to old and new pipe lines provide funnel-shaped outlet, thus reducing friction and turbulence at joint. Fitting is first tack welded, then puddle welded along the V-edge. Then section of pipe inside fitting is separated by an S-shaped cut and individual pieces removed, leaving way clear for attachment of branch pipe. Weldolets supplied for welded and Thredolets for threaded connections. Bonney Forge & Tool Works, Allentown, Pa.



TRUCK-MOUNTED MIXER made in 1-, 2- and 3-cu. yd. sizes. Body consists of tilting container inclosing a spiral rotor mounted on Timken bearings. Entire steel construction with manganese steel rotor blades. Rotor driven by truck motor through power take-off with two rotor speeds and reverse action. Mixes and agitates contents of body and pushes it to side spout, making unit practically self-cleaning. Ball bearing gears and shafts. — Concrete Transport Mixer Co., 650 Rosedale Ave., St. Louis, Mo.

CONCRETE VIBRATOR *(left)* for settling and compacting dry concrete. Made in two types, one to be used on flat slabs, beams or girders, and the other to be clamped on walls, mass concrete or concrete product forms. Equipped with air driven, eccentric rotor controlled by amount of air pressure. With 20 lb. per square inch, 1,000 vibrations can be obtained; with 85 lb. 3,000 vibrations. Consistency of concrete is controlling factor in determining proper frequency to be used. Made by A. W. Munsell in collaboration with technical forces of Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York City.

Present and Accounted For —

A Page of Personalities

CITY ENGINEER FOR 43 YEARS. Charles U. Boley *(left)* retired May 1 as engineer of Sheboygan, Wis., after continuous service since 1888. He is succeeded in office by his son, Arthur L. Boley, formerly assistant city engineer.

RECEIVES DEGREE. Jay Downer *(below)*, chief engineer of the Westchester County Park Commission, Bronxville, N. Y., was made a Doctor of Science by Columbia University at its recent commencement exercises in New York.

HEADS FEDERAL BOARD. Col. D. H. Sawyer *(above)*, former secretary, Associated General Contractors, has been appointed director of the Federal Employment Stabilization Board, Washington.

BUILDERS OF ST. JOHNS BRIDGE across Willamette River at Portland, Ore. *(Left to right standing)* C. L. Ammon, asst. engr., Robinson & Steinman, cons. engrs.; Elmer Busby, supt. La Pointe Const. Co. (west approach); I. G. MacDuff, conc. insp., Northwest Testing Laboratory; J. G. Johnson, engineer, Robinson & Steinman; W. E. Pomeroy, supt., J. H. Pomeroy & Co. (steel); Otto Herman, supt., Gilpin Const. Co. (east piers); J. N. Hicks, engr., John A. Roebling's Sons Co. (cables); L. W. Friberg, engr., Robinson & Steinman, and W. B. Willetts, foreman, John A. Roebling's Sons Co. *(Sitting)* George Green, supt., John A. Roebling's Sons Co.; R. Tench, inspector, Robt. W. Hunt Co., and A. J. Lindstrom, Lindstrom & Feigenson, contractors (decking).

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Speeds production . . .
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All Western Crawler Wagons can be equipped!

No wagon man needed with Western Crawler Wagons equipped with Spring Wind-up. Dump boss or tractor operator trips loads and winds up doors.

NOW contractors can actually add money to their profits that used to be spent for an extra man to trip loads and wind up doors!

This important saving is made possible by the remarkable new Spring Wind-Up for Western Crawler Dump Wagons. It is a simple, easily operated door control device that can be readily attached to both direct-hitch or front truck wagons and needs no special connections on the tractor.

No complicated mechanism or outside power is required. Gravity and spring action do all the work and it operates equally well at all temperatures. A single pull on a rope running to the tractor, or a single pull on the lever by the dump boss trips the load. A second pull closes the doors after the wagon has moved free of the dumped load. A large torsion spring closes the doors instantly even under the severest conditions.

This instantaneous action enables Western Crawler Dump Wagons to be used on even the shortest hauls without having to wait for the door wind-up! On *all* hauls the new Spring Wind-Up is ready for reloading more quickly—increasing daily yardage. Write today for facts about the Spring Wind-Up on new or present equipment. The Austin-Western Road Machinery Co., 400 N. Michigan Avenue, Chicago, Illinois. Branches in principal cities.

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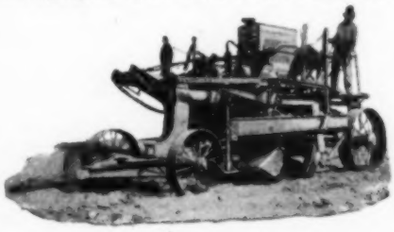
New Austin Contractor's Special Elevating Grader

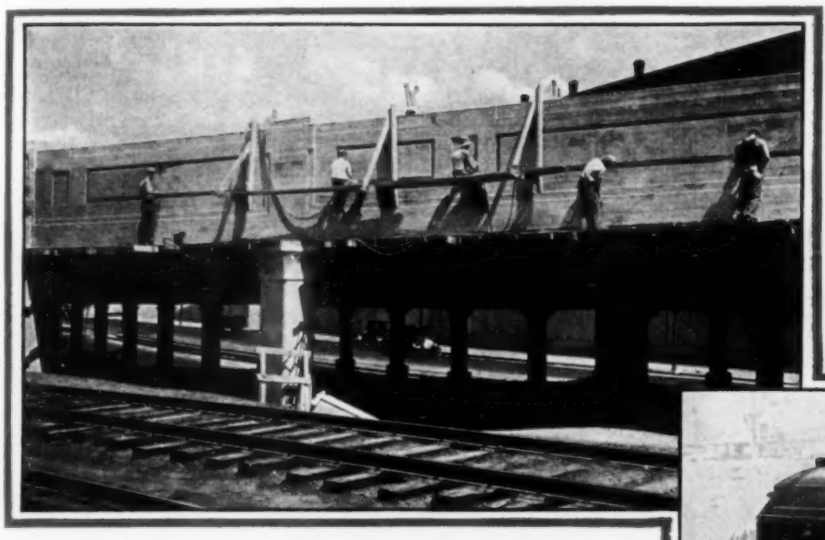
THE FINEST AUSTIN ELEVATING GRADER EVER BUILT. Strength—capacity—output—smooth operation—durability—all are obvious when you've seen it perform. Motor driven carrier enables it to develop maximum capacity regardless of soil conditions. Has longer guard rollers under discharge to avoid damage from wagons—heavier supporting chains—higher steel side boards, improved all-metal belt drums—sturdier frame—larger plow beam and stronger engine hitch.



New Western No. 6 Elevating Grader

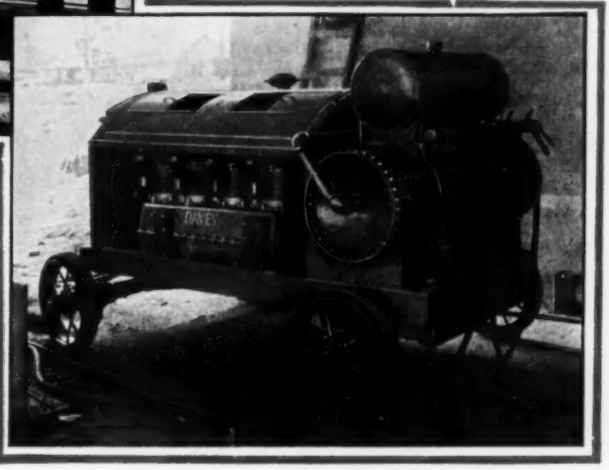
The new Western No. 6 Elevating Grader, too, has engine mounted on the machine to operate the carrier. 10-inch steel tube "backbone" provides a powerful frame to withstand the twisting strains from a heavy load on the carrier. Three-point suspension principle stops frame distortion and "floating" belt trouble. Other details: Girder front axle and "H" beam tongue with a powerful coil spring to take up starting shocks, ball and socket front end, new control for plow regulates pressure and permits cutting harder ground than ever before.

Davey "Air-Cooling" Cuts Costs *on Air Compressor work...*



320 cubic foot Davey "Air-Cooled" Compressor, owned by M. E. White Construction Co., Chicago, providing air for 4 cement surfacers on Dayton & Union R. R. portion of $5,000,000 joint track elevation project of Erie, Big Four, Pennsylvania and B. & O. at Dayton, Ohio.

As with all Davey Compressors, the operator cranks only the engine to put this 320 cubic foot compressor to work; with engine running, the compressor starts pumping air with a pull on the clutch lever. No skinned knuckles or strained backs turning over a heavy compressor by hand—starting time saved amounts to several hours every week.

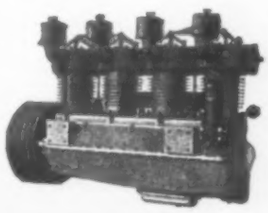


IMPORTANT contracting companies, leading public utilities, and Federal, State, County and Municipal Departments have investigated and have purchased Davey Compressors as a result of their comparisons. From such users now come many reports that Davey "Air-Cooling" is providing substantial economies in compressor operation.

It costs less, they say, to operate Davey Compressors because "Air-Cooling" gets rid of compression heat *quickly,* retards carbon formation and eliminates periodic shutdowns for carbon cleaning. With no carbon accumulating on the valves, air supply and pressure always stay up to full rating; users can operate as many tools from each compressor toward the end of a job as when beginning the work.

Other savings reported are that their men can work faster because tools stay cooler and are easier to handle. They are apt to work more steadily, for with better engineering design and absence of water cooling complications, dependable compressor operation has been made more certain.

With Davey Compressors, your men have *from 600 lbs. to 2½ tons less dead weight* to handle and move around on the job. For truck mounting the 110 cu. ft. Davey unit needs only a 1-ton short wheelbase Ford truck chassis; the 320 cu. ft. Davey Compressor mounts on any 2-ton truck, instead of the 3½ to 5-ton ordinarily required. You can easily figure the size of this saving in initial cost of truck and compressor combination, and the continued savings in operating and maintenance costs.



Investigate these Davey Compressor savings, for yourself. Ask us where you can see a Davey Compressor near you. Use the coupon.

The method of cooling air compressors through the use of metals of high heat conducting quality and capacity, as contained in Davey Compressors, is fully protected by patent

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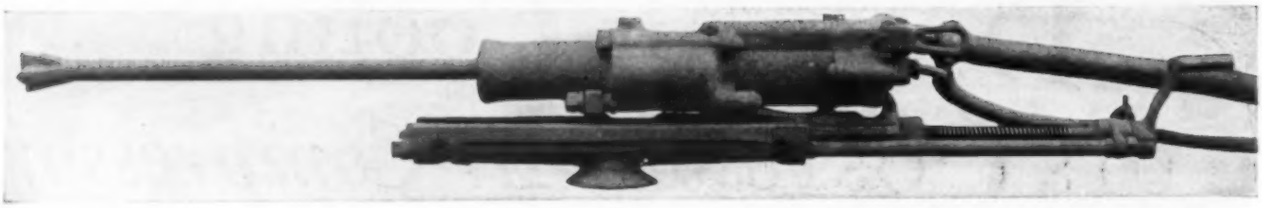

The Coldbrook-Swift Tunnel gets three Worthington Aids

FOR the important task of constructing the nine-mile Coldbrook-Swift Tunnel for the Massachusetts Metropolitan Water District Commission, the Wenzel and Henoch Construction Company selected Worthington equipment.

For tunnel headings and bench work, the Worthington-Gilman No. 50 drifter will be used; for shaft sinking, the Worthington-Gilman No. 49 rock hammer, and for heating and tempering the steels, Worthington-Gilman furnaces were logically selected.

The pistons of these drills are free to perform just one job . . . hammer the drill steel. Rotation is left to a powerful, independent, balanced motor. And the result is greater hole footage per hour.

Worthington engineers will be glad to discuss your rock drilling problems with you. Write to, or call at, the nearest district office. There is no obligation.

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The Shear Cutter

This is the most recent adaptation of the Porter lever and toggle joint principle and is the first Porter tool having jaws operating on the shear principle with the cutting edges passing each other in the cutting operation.

It is made in three sizes, 14 in., 24 in. and 36 in. The 36 in. has a capacity of 5-8 in. soft wire rope or flat bars 1 1-2 in. x 9-32 in.

In cutting wire rope the Shear Cutter severs every strand and leaves no uncut or ragged edges. On flat stock the cut is clean and the edge of material is not unduly twisted or distorted. The Shear Cutter is rapidly gaining recognition as a valuable time saver in many industries as well as an emergency tool for airports. It has the cutting capacity of a bench or power tool plus portability. It is used extensively in wire rope plants and has been found to meet a long felt want in elevator and hoist installation work where wire cable is used. Telephone and power companies are using this tool with great satisfaction on guy wire and it promises to be one of the most popular models ever brought out by this company.

The Porter line of portable cutting tools includes Bolt Clippers, Chain Cutters, Nut Splitters, Shear Cutters, Wire Cutters, etc. in a number of sizes and models. Write for folder illustrating and describing the Porter line.

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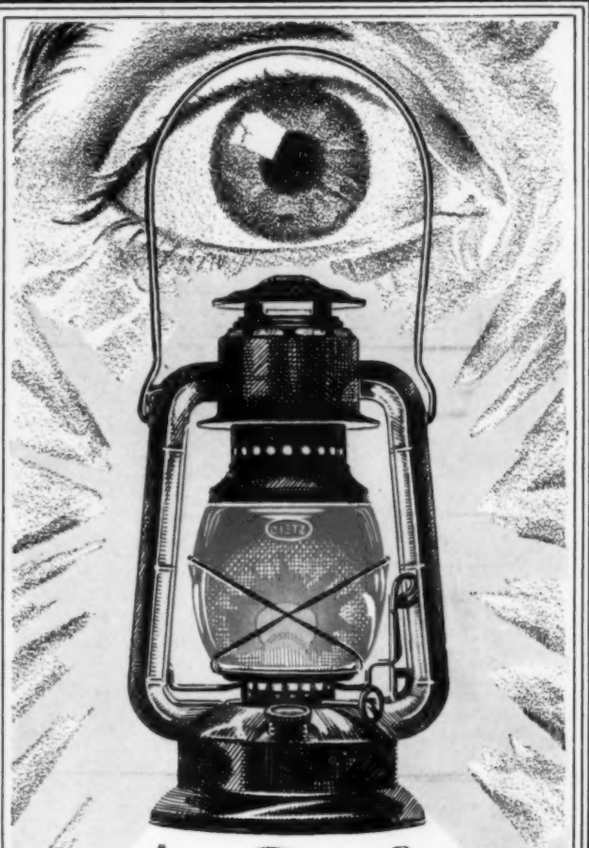

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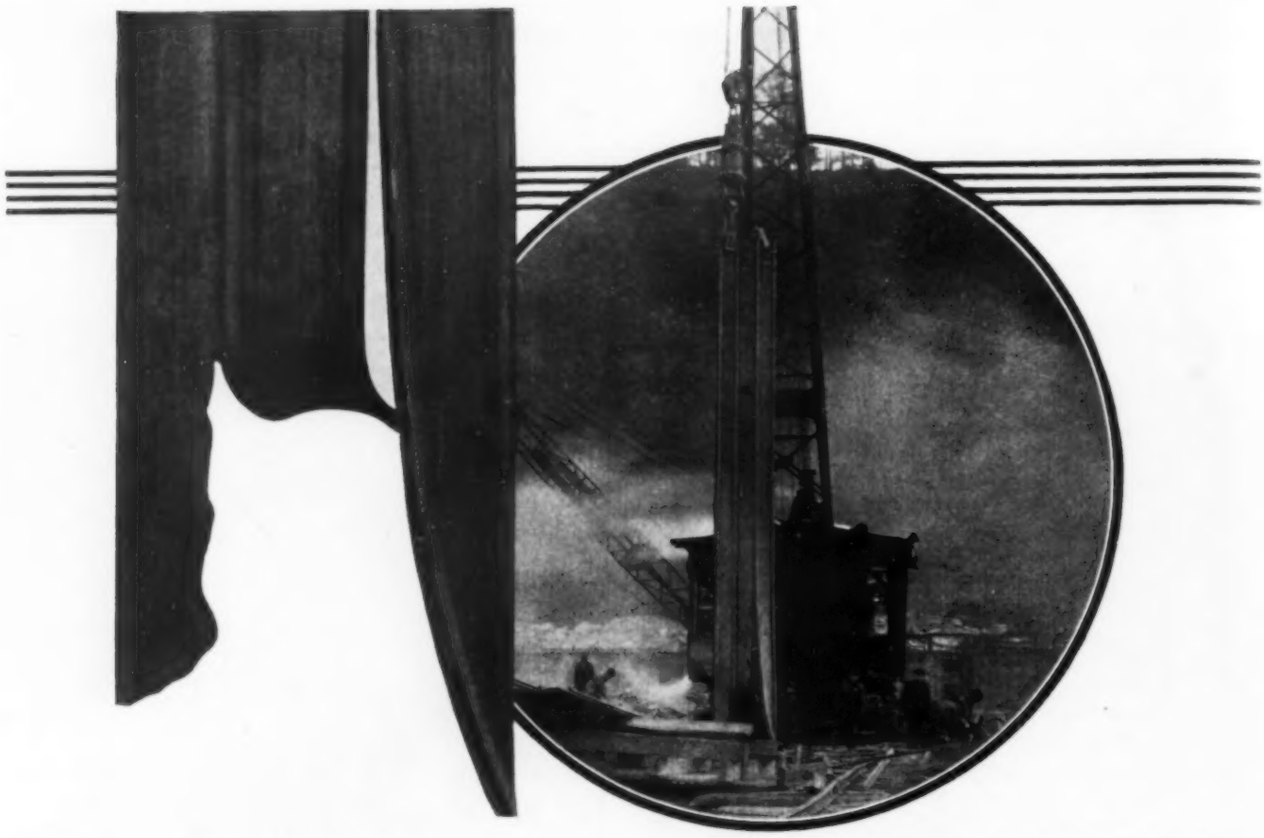


Piles extracted by the Vulcan at Lock and Dam No. 8 on the Allegheny River for the U. S. Government by the United Engineers & Constructors, New York City.

Speaking of PILE EXTRACTION

If you have any doubt of the ability of the Vulcan Extractor to handle the more difficult jobs, just look at the photographs shown above. They show 3 pieces of 35-foot, 15-inch sheeting that were driven to nearly full penetration into sand, gravel, and boulders. Notice the deformed and twisted condition of the sheeting. And yet, the Vulcan Extractor pounded them out with its usual efficiency and dispatch.

The same true "punching action" for which the Warrington-Vulcan Pile Hammer has been noted, obtained by the scientific adjustment of weight of ram to height of fall, has been built into the Vulcan Extractor.

It is a real economy to own this separate extractor, built and designed for this single specific purpose.

VULCAN IRON WORKS
327 N. IRVING AVE., CHICAGO, ILL.

Representatives for California, Nevada, and Japan:
Harron, Rickard & McCone Co.,
1600 Bryant St., San Francisco, Calif.

Southern Representatives:
Woodward, Wight & Co., Ltd.,
451 Howard Ave., New Orleans, La.

Representatives for Washington and Oregon:
A. H. Cox & Co.,
1757 First Ave., South,
Seattle, Wash.

THE VULCAN EXTRACTOR

TRACTION MAKES • • YARDAGE

SUMMER showers try to rob the contractor of precious hours — "Caterpillar" Tractors foil the treachery of mud and soft soils. Steadily, day after day, the yardage records climb as the "Caterpillars" pull full-loaded wagons. Here is a scene on the Mississippi where a dragline loads big Euclid wagons — the National Dredging Co. operates the outfit. Riding loose earth, climbing out of a deep rut, nosing in close to the shovel, rolling over the slippery places — conquering countless obstacles — are the feats of the "Caterpillar" track-type Tractors that win the approval of thousands of critical contractors!

Caterpillar Tractor Co.

PEORIA, ILLINOIS, U. S. A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)

Prices—f. o. b. Peoria, Illinois

TEN	$1100	TWENTY . .	$1900
FIFTEEN . .	$1450	THIRTY . .	$2375
SIXTY	$4175		

CATERPILLAR

REG. U. S. PAT. OFF.

TRACTOR

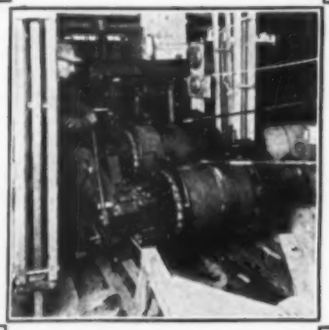
Come to Headquarters

One of the New Novo Self-Priming Centrifugals—It primes itself, no air pumps, floats, foot-valves or similar gadgets.

HEADQUARTERS has been ident with hoist and pump manufac since the beginning of the modern struction era. *Headquarters* has s basically to its knitting until tod can offer 98 different pump models- different hoist models—and, more cently, 24 different portable ligh plants. These lines include models every conceivable type of job. And models include many features could only belong to *Headquarters* for value and performance in Pu Hoists or Portable Lighting Pl come to *Headquarters*. *Headquar* for your territory is listed to the

Come to Headquarters

A New Double Drum Model W H high speed building hoist on a Cincinnati construction job. Just one of the 108.



Come to Headquarters

A Novo Dragline Hoist operated by Scarlett & Earl, Inc., in Michigan. One man takes out about 600 cu. yds. per day.

Left: *Novo Model LH Hoist mounted on a traveler erecting steel on a bridge job over the Aqua Friu River, Ariz.*

Right: *Novo Double Rollr Ring Pump—No Diaphragm to wear—two rolling rubber rings, guaranteed for one year, preserve suction and friction and defy wear.*

Come to Headquarters

One of the Novo Portable Lighting Units designed especially for road and construction jobs. It turns night into day at low cost.

Here Is Your Local Headquarters

ALABAMA: BIRMINGHAM
The Young & Vann Supply Co.

ALABAMA: MOBILE
McGowin-Lyons Hdwe. & Supply Co.

ARIZONA: PHOENIX
Mine & Smelter Equipment Co.

ARKANSAS: LITTLE ROCK
Joe Lyons Machinery Co.

CALIFORNIA: LOS ANGELES
Crook Company

CALIFORNIA: SAN FRANCISCO
Krats & McClelland, Inc.

COLORADO: DENVER
Hendrie & Bolthoff Mfg. & Supply Co.

D. C.: WASHINGTON
Thomas M. Brown (Baltimore)

FLORIDA: JACKSONVILLE
Farquhar Machinery Compan,

FLORIDA: MIAMI
Llewellyn Machinery Corp.

GEORGIA: ATLANTA
Tractor & Machinery Co., Inc.

GEORGIA: AUGUSTA
Lombard Iron Works & Supply Co.

ILLINOIS: CHICAGO
Paul B. Cochran Equipment Co.

ILLINOIS: CHICAGO
Great Lakes Supply Co.

ILLINOIS: CHICAGO
Novo Engine Co. (Parts & Service)

ILLINOIS: JOLIET
Barrett Hardware Co.

ILLINOIS: PEORIA
A. E. Hudson Company

INDIANA: INDIANAPOLIS
Bock Equipment Company

INDIANA: SOUTH BEND
South Bend Supply Co.

IOWA: DES MOINES
Globe Machinery & Supply Co.

KANSAS: WICHITA
Geo. C. Christopher & Sons

KENTUCKY: FRANKFORT
Frankfort Equipment Co.

KENTUCKY: PADUCAH
Henry A. Petter Supply Co.

LOUISIANA: NEW ORLEANS
Equitable Equipment Company, Inc.

LOUISIANA: SHREVEPORT
Baggett Machinery Company

MARYLAND: BALTIMORE
Thomas M. Brown, Inc.

MASSACHUSETTS: SO. BOSTON
The Bond Co.

MICHIGAN: DETROIT
W. H. Anderson, Inc.

MICHIGAN: FLINT
E. A. Sackerman & Co.

MICHIGAN: GRAND RAPIDS
Kellogg-Burlingame Company

MICHIGAN: JACKSON
Fred W. Lemcke

MINNESOTA: MINNEAPOLIS
H. E. Erickson Equip. & Supplies Co.

MISSOURI: JOPLIN
E. A. Martin Machinery Co.

MISSOURI: KANSAS CITY
English Brothers Machinery Co.

MISSOURI: ST. LOUIS
Fickelssen-Finney Equipment Co.

MISSOURI: SPRINGFIELD
E. A. Martin Machinery Company

MONTANA: BUTTE
Hall-Perry Machinery Company

NEBRASKA: OMAHA
Interstate Machinery & Supply Co.

NEW YORK: ALBANY
Thos. Smyth

NEW YORK: ALBANY
R. B. Wing & Son

NEW YORK: BUFFALO
Dravo Equipment Co.
Wheeler Equipment Co.

NEW YORK: LONG ISLAND CITY
E. B. Kelly Co., Inc.

NEW YORK: NEW YORK CITY
Novo Engine Company

NEW YORK: NEW YORK CITY
John Reiner & Company, Inc.

NEW YORK: SYRACUSE
Buell Equipment Corporation

NORTH CAROLINA: RALEIGH
Raleigh Tractor & Equipment Co.

OHIO: CINCINNATI
The Mechanical Supplies Co.

OHIO: CLEVELAND
Dravo Equipment Company

OHIO: COLUMBUS
The Taylor Tractor Co.

OHIO: TOLEDO
The National Supply Company

OKLAHOMA: OKLAHOMA CITY
Wylie-Stewart Machinery Co., Inc.

OREGON: PORTLAND
Western Road Machinery Co.

PENNSYLVANIA: PHILADELPHIA
Reeves-McCormick, Inc.

PENNSYLVANIA: PITTSBURGH
Dravo Equipment Company

SOUTH CAROLINA: COLUMBIA
Tidewater Supply Company, Inc.

SOUTH DAKOTA: SIOUX FALLS
Western Material Company

TENNESSEE: JOHNSON CITY
Summers Hardware Company

TENNESSEE: KNOXVILLE
Dempster Equipment Company

TENNESSEE: MEMPHIS
Pidgeon-Thomas Iron Company

TEXAS: DALLAS
Briggs-Weaver Machinery Co.

TEXAS: EL PASO
Don A. Carpenter & Company

TEXAS: HOUSTON
R. B. Everett & Company

TEXAS: SAN ANTONIO, WACO, CORPUS CHRISTI
San Antonio Machine & Supply Co.

UTAH: SALT LAKE CITY
Lund & Company

VIRGINIA: NORFOLK
Tidewater Supply Company, Inc.

VIRGINIA: RICHMOND
James McGraw, Inc.

VIRGINIA: ROANOKE
Southern Machinery & Supply Co.

WASHINGTON: SEATTLE
Star Machinery Company

WEST VIRGINIA: BLUEFIELD
Bluefield Supply Company

WEST VIRGINIA: CHARLESTON
Baldwin Supply Co.

WEST VIRGINIA: HUNTINGTON
Banks-Miller Supply Company

WISCONSIN: MILWAUKEE
W. A. Nelson Equipment Co.

CANADA: B. C.: VANCOUVER
B. C. Equipment Company, Ltd.

CANADA: MAN.: WINNIPEG
Powell Equipment Co., Ltd.

CANADA: ONT.: LONDON
London Concrete Machinery Co., Ltd.

Come to Headquarters

Novo DH Double Dru tric Hoist handles th one drum on concret other on material s versing sheave handle platform elevator.

Come to Headquarters

Novo Road Pump with the high-speed stroke and patented Water Governor which end water hammer and excessive line pressures.

Come to Headquarters

This Novo Double, Top, force diaphragm operated 1128 hours a shutdown on this 11-

NOVO ENGINE COMPANY

Clarence E. Bement, Vice-Pres. and Gen. Mgr.

214 Porter Street, Lansing, Michigan

This coupon brings complete information from H. Q. on the units checked.

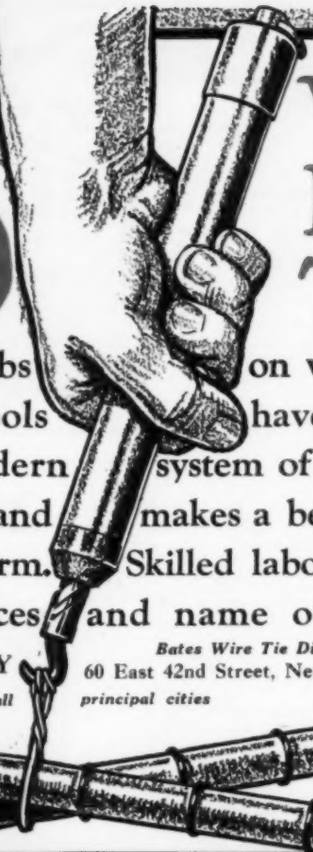
- ☐ Self-priming Centrifugal Pumps
- ☐ Standard Centrifugal Pumps
- ☐ Sand and Gravel Pumps
- ☐ Road and Pressure Pumps
- ☐ Diaphragm Pumps
- ☐ Roller Ring Pumps
- ☐ Building Hoists
- ☐ Dragline Hoists
- ☐ Pile Driver Hoists
- ☐ Cableway Hoists
- ☐ Lighting Units
- ☐ Gasoline Engines

Name..... Address.....

NOVO

Headquarters for Engines, Pumps, Hoists, Lighting Units

BATES WIRE BAR TIES



THE many building jobs on which Bates Wire Bar Ties and Tying Tools have been used show conclusively that this modern system of bar-tying doubles the production of the men and makes a better, stronger job. Every tie is tight and uniform. Skilled labor is not required. Write us for description, prices and name of nearest dealer.

ST. REGIS PAPER COMPANY
Distributors in all principal cities

Bates Wire Tie Division
60 East 42nd Street, New York, N. Y.

HERCULES

EXPLOSIVES AND BLASTING SUPPLIES

PERFORMANCE
ECONOMY
SAFETY

HERCULES POWDER COMPANY
925 KING STREET, WILMINGTON, DELAWARE

ALWAYS on the Job.

The **Toledo Torch**
a Safety Light that
does not invite theft

Made only to protect *your* job. You have none of the old time problem of theft. Just fill them, light them and forget them. They'll stay right on the job

USE THE TOLEDO TORCH IN OTHER SIGNAL MEANS SAFETY

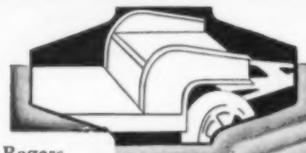
The Toledo Pressed Steel Co.
TOLEDO OHIO

Save with Steel

Manufacturers of The Toledo Horse — the ideal highway barricade

Name Address

ROGERS TRAILERS



DISTINGUISHING characteristics of Rogers Trailers have always included extreme low loading height and lightness in proportion to capacity, making possible the movement of the heaviest loads with maximum profit.

Pioneering in design, as well as the use of alloy steel, cast steel wheels and heavy mill type Timken Bearings, Rogers Brothers have always maintained the highest in heavy duty trailers.

ROGERS BROTHERS CORPORATION
106 ORCHARD ST., ALBION PENNA.

★ Write for Catalog NO. 28

Reduce the Cost of your Protection

. . . by putting *Cleveland Flaming Torches* on the job.

Their original cost is low—they are economical on fuel. Special burner gives a full, visible flame in all weather for as long as 48 hours. Strong—dependable—stay put.

The Consolidated Iron Steel Mfg. Co.
1200 E. 53rd St.,
Cleveland, O.

WRITE
Find out what these torches can save you on your job.
Write for prices.

You Can Do This

with a WARCO

Center Control puts the operator above his blade where he can see what he is doing, and away from dust and the motor's smell and heat.

Every road needs a WARCO Power Grader.

W. A. RIDDELL COMPANY
BUCYRUS OHIO

Power Graders » Wheeled Scoops » Rear-Type Crawlers for Tractors

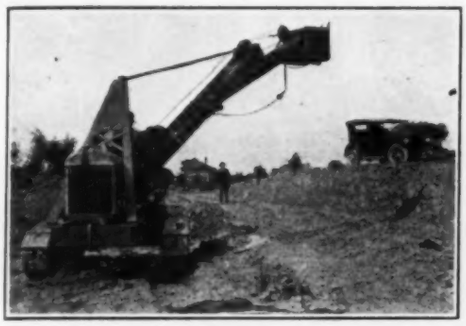
MORITZ SHOULDER AND BERM MACHINE

NEWER - BIGGER - BETTER ★
SPEEDS UP PRODUCTION - CUTS COSTS

- ENGINEERS LIKE IT - CONTRACTORS NEED IT -
USED IN MORE THAN TWENTY STATES

MORITZ-BENNETT CORPORATION
EFFINGHAM, ILLINOIS

THE FUNDOM



WORKS AT A PROFIT

THE Fundom always works at a profit. It's designed and built to save money on average sized and small jobs.

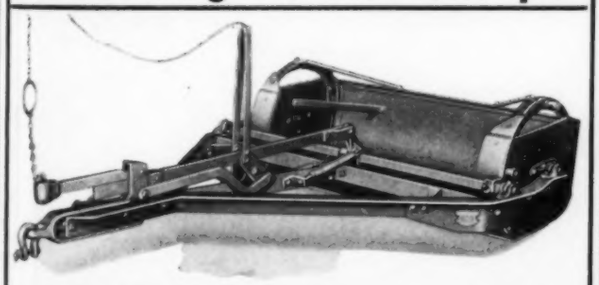
With ⅛ yard dipper capacity, ¾ full swing, radius of 16½ feet, unusual speed, sturdy construction, the Fundom makes money on every job.

With Boom Extension for clamshell, dragline or crane work, and Trench Hoe Attachment for ditching, the versatility of the Fundom is apparent.

You owe it to yourself to investigate the profit-making possibilities of the Fundom. Get the details and name of nearest dealer. Address—

THE FUNDOM HOIST & SHOVEL CO.
314 Central Building, Lima, Ohio

Engineers praise NEW RC GROUNDHOG Revolving Tractor Scraper



"Certainly a great improvement . . . so much easier to handle and operate . . . has any other scraper beat a mile."* Tractor driver operates scraper by rope controls, using any type of tractor, under any working conditions. Quick change to automatic or semi-automatic control. Tractor pulls scraper into cut, loads, pulls out of bite, carries, dumps and spreads load without attention of driver. Adjustable roller bowl stops.

* From actual letters in our files.

Farm Tools, Inc.
Dept. 75
Mansfield, Ohio

Write for Facts

USE IT ANYWHERE
WHERE THE GOING IS HARD

On exposed gears . . . DIXON'S clings to the teeth providing a protective coating that greatly reduces friction.

On wire ropes . . . the graphite penetrates the strands, thoroughly lubricating them.

On pump plungers . . . it coats the surfaces with a film of graphite, decreasing friction and extending the life of the equipment. On any exposed equipment . . . it prevents rust.

DIXON'S Waterproof Graphite Grease maintains a wear-resisting graphite surface between parts that otherwise would be in metallic contact. It is remarkably adhesive without being gummy or sticky. Water will not wash it off. It is unaffected by sea water, alkaline or acid waters. It is the ideal lubricant for heavy service.

DIXON'S WATER-PROOF GRAPHITE GREASE

Other DIXON Products

Flake Graphite
Graphite Seal
Graphite Cup Grease
Pipe Joint Compound
Belt Dressing

Joseph Dixon Crucible Company

Jersey City — New Jersey

104 YEARS OF DIXON SERVICE

—for *Builders, Contractors, Engineers, Architects, Executives and Students*

HERE is a set of books that is packed to the covers with plans and methods for speeding up production, saving materials and labor, and cutting costs. The six books cover every phase of practical construction work from estimating building costs to the selling of construction service—from plan reading and quantity surveying to practical job management. With these books, the contractor and construction superintendent can make costs come down and profits go up!

The Dingman Building Contractors Library

The Dingman books have won a wide reputation among builders and building contractors for their sound, practical and easy-to understand discussion of building construction work. All of the material has been drawn from actual practice.

This library is intended for —

[1] The building contractor who wants a handy reference set that will give him almost instantly a ready answer to most of the problems that come up in the course of the day's work.

[2] The young men in the building industry who intend to make the business of construction their life work, and who want the kind of guidance that will aid them to climb to the top.

Six Volumes, 1149 Pages, Pocket Size, Fully Illustrated

Each one of the volumes in this set is a complete handbook on some important subject. Sturdily bound and pocket size, it will go right "on the job" with you for immediate consultation.

Practical facts on every phase of building construction

Practical data is given on analyzing a construction job into its component parts—estimating the costs of labor, haulage, equipment, materials, etc.—plan reading and determining quantities from specifications—personnel management—successful supervision of every building operation—efficient and economical business methods—office procedure such as accounting, banking, purchasing, etc.—advertising and selling methods for contracting service—and a complete data book of tables, forms and calculations most frequently used by the builder.

Free Examination—Small monthly payments

Without a cent of expense—without any obligation on your part—you may examine the Dingman Building Contractors' Library for 10 days and determine its value for yourself. Try the books out on your everyday problems—make them prove their worth to you. Unless they meet every test send them back at our expense. If the books prove satisfactory and you decide to keep them, pay only $1.50 in ten days and then $2.00 a month for six months.

MC GRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y.

You may send me for 10 days' free examination, the new six-volume Dingman BUILDING CONTRACTORS' LIBRARY. I agree either to return the books at the end of 10 days or send a first payment of $1.50 then and $2.00 a month for six months.

Signed .....

Address .....

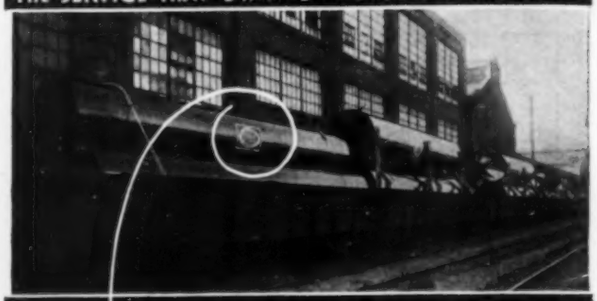
City and State .....

Official Position .....

Name of Company .....

(To insure prompt shipment, write plainly and fill in all lines.) C.M. 8-31

THE SERVICE THAT STARTS IN BIGGS' PLANT . . . .



SHOWS ITSELF MOST CLEARLY IN YOUR DITCH

Above is a typical day's production of Biggs electrically welded steel pipe in connection with three major water works projects involving 50,000 feet of 30 in., 48 in., and 72 in. welded pipe.

BIGGS Electrically Welded Steel Pipe comes to you exactly as you want it. Actual acquaintance with field conditions you will encounter enables Biggs service to save time and money in your construction costs. Joints come at convenient points. Specials are on hand when needed. The pipe fits accurately. Testing goes off without a hitch. Consult with Biggs on the next pipe line in your territory.

BIGGS WELD
DUCTILE
UNIFORM
STRONGER THAN THE PLATE ITSELF

The Biggs Boiler Works Co., Akron Ohio.

BULL FROG WHEELBARROWS

Seamless, smooth, pressed steel trays

High tray-front and risers give increased capacity and put load *over the wheel*

Heavy angle-iron legs, extended to reinforce handles; double-bolted for rigidity

Heavy angle-iron wheel guard strengthens frame at front

Renewable malleable iron leg-wear shoes

"Never Break" wheel with rivetless malleable iron hub

Grease pocket in hub for efficient lubrication

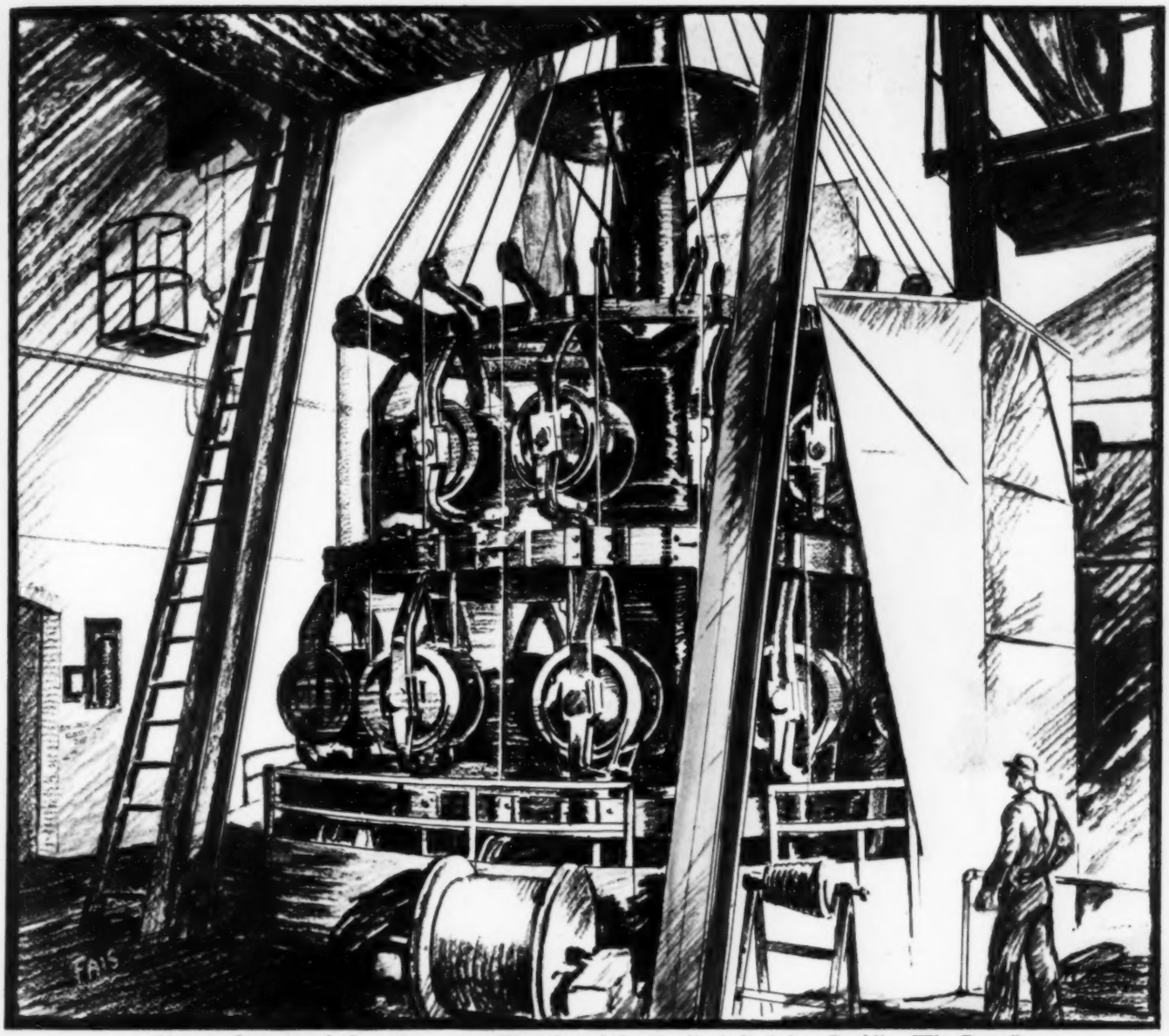
Malleable iron axle boxes

These advantages tell why Bull Frog barrows last longer and carry more per day per man. They are worth money to any contractor.

Catalog of complete line of barrows, carts and scrapers upon request

THE TOLEDO WHEELBARROW COMPANY
TOLEDO, OHIO

Branch Office and Warehouse: CHICAGO—520 W. Erie St.



No. 11 of a series of advertisements on "How Superlative Quality is Built into Roebling Wire Rope."

It strands 37 wires *in one operation*

THIS GIANT SPINS—not fine, soft yarn—but "threads" of steel. It can take as many as 37 tough steel wires—each almost a quarter inch in diameter—and with surprising ease "lay" them into a great steel strand of tremendous strength. Each of its 36 whirling bobbins holds over half a ton of wire.

But it is not the dramatic in this Titan that should especially interest the rope buyer. Rather, it should be the fact that this machine is a striking example of the great lengths to which Roebling goes to engineer into every Roebling Rope a maximum of suitability, safety and stamina.

One of the many stranders at Roebling, this particular machine makes possible the production of *highly efficient* large diameter ropes, such as mammoth dredge ropes, possessing an exceptionally high degree of pliability. It makes strands for these ropes *in one operation*—assuring maximum metallic content for any given cross-sectional strand area. This, in turn, means greater strength and less internal wear.

ROEBLING **WIRE ROPE**

"BLUE CENTER" STEEL

Erected in 3½ working days!

THIS is a story of fast work... and an ingenious method of erecting towers —in bridge building.

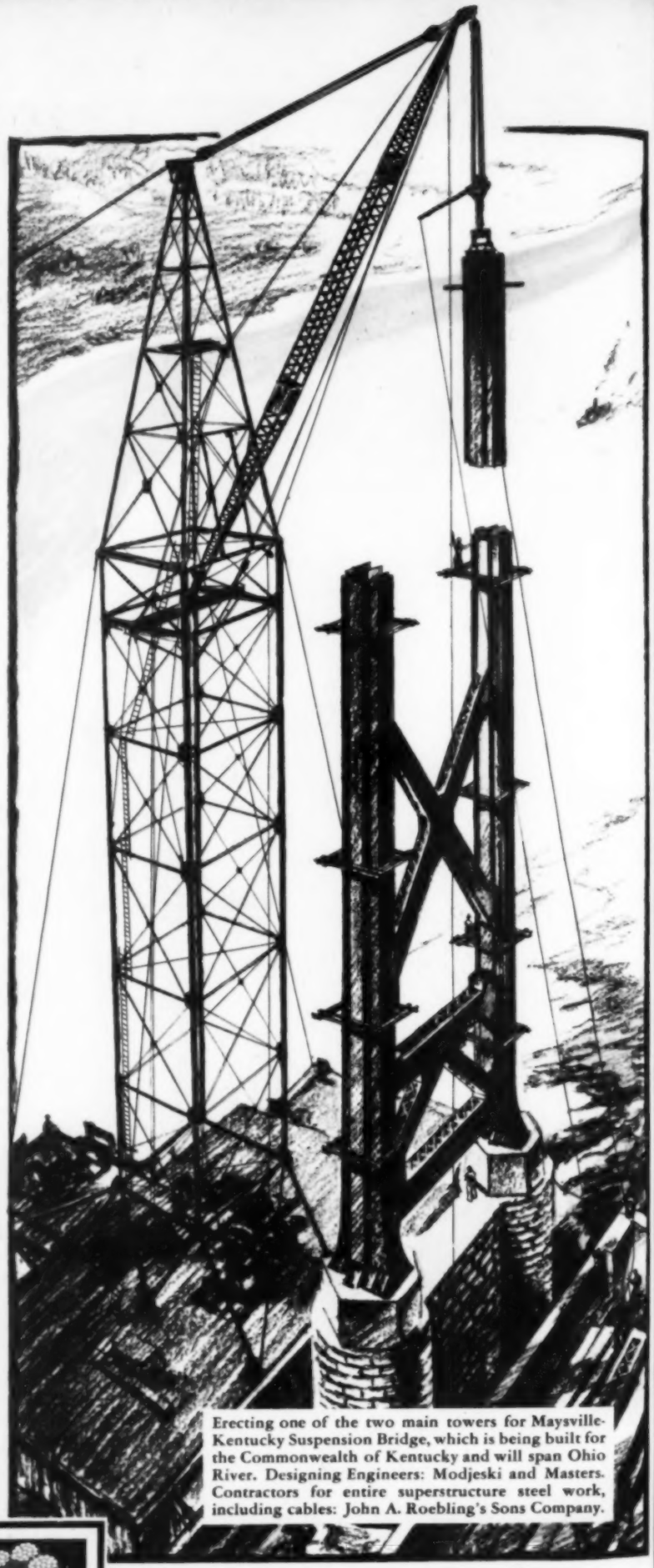
The bridge—Maysville-Kentucky, spanning the Ohio River. Type:—suspension. Main Span:—1060 feet.

To facilitate the erection of the two main towers for this bridge—each of which contains approximately 350 tons of steel —the unique floating derrick tower shown was designed and used by Roebling. The derrick tower itself is made of about 85 tons of structural steel and is erected on two steel river barges lashed together. It stands 200 feet above water level, is equipped with a 125 foot boom and has a capacity of 25 tons.

Time to erect tower on Kentucky side of river:—3½ working days! 4½ working days—for tower on Ohio side!

Derrick tower, with which loads as heavy as 25 tons were handled with ease and safety, was rigged with Roebling "Blue Center" Wire Rope. For the main cables of the bridge, 61 Roebling Bridge Strand Cables will be used. For the Suspender Ropes:—Roebling 1¾" Bridge Cables.

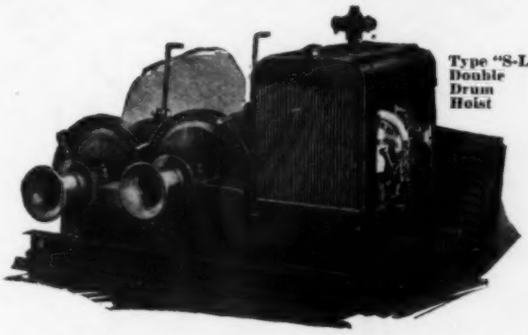
JOHN A. ROEBLING'S SONS COMPANY
WIRE...WIRE ROPE...WELDING WIRE...FLAT WIRE
COPPER *and* INSULATED WIRES AND CABLES
WIRE CLOTH *and* WIRE NETTING
Branches in Principal Cities *Export Dept. : New York*



Erecting one of the two main towers for Maysville-Kentucky Suspension Bridge, which is being built for the Commonwealth of Kentucky and will span Ohio River. Designing Engineers: Modjeski and Masters. Contractors for entire superstructure steel work, including cables: John A. Roebling's Sons Company.

ROEBLING "BLUE CENTER" STEEL **WIRE ROPE**

HOIST CONVENIENCE



Type "S-LG" Double Drum Hoist

Convenience is a very necessary factor in hoist design and was emphasized in the design of

DAKE Gasoline & Electric Hoists

All operating and control levers for the hoist and power unit are within easy reach from the operator's position. The Continental gasoline engine has all accessories get-at-able from the rear end. Convenience means better attention, less stops and delays, more work and a better profit producer for you on the job.

Look for this hoist convenience when you buy.

Catalog and full information on request.

DAKE ENGINE COMPANY

Grand Haven, Michigan

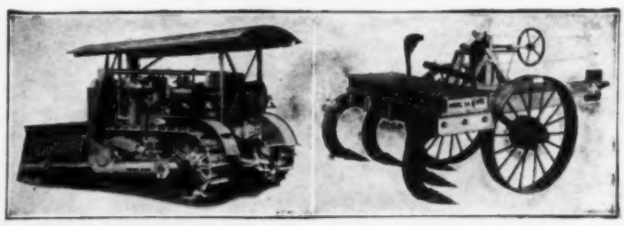
The above train of 6 Baker Maney Scrapers (Model DR) is turning around in a space 20 feet wide—smoothly and without strain. This is only one of the many Baker Maney features.

1½ cu. yd. — 1 cu. yd. — ¾ cu. yd.

Besides the short turning radius, remember that single trains of Baker Maneys dig, load, haul, dump, spread and compact 700 to 750 cubic yards of dirt per day using only two scraper men. You can get lower costs per yard on the shorter hauls than by any other method.

Timken Bearings—powerful frame construction—four wide wheels—accurate control of pan are other features that make Baker Maneys lead the field.

You Need These Baker Products, Too



Baker Bulldozers

Twin-cylinder — balanced — great strength — light weight — free draw bar — great lifting range. Get details concerning these Bulldozers for Caterpillar and Monarch Tractors.

Baker Road Rooters

Break up old roads and tough soils with these powerful, quick lift, high clearance Rooters. Two sizes to suit your tractor. Ask for literature and prices.

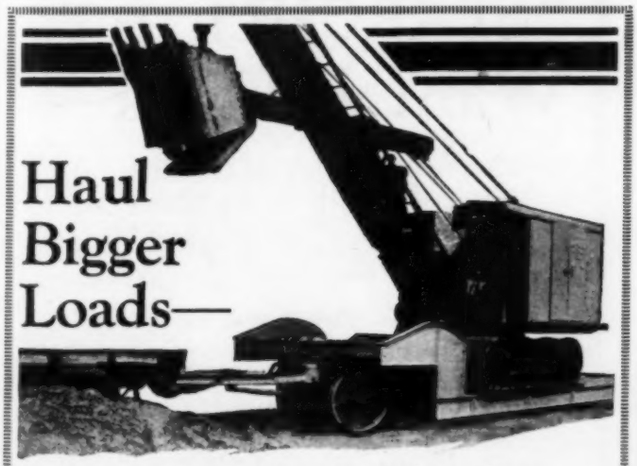
BAKER TRACTOR EQUIPMENT
EARTH MOVING-ROAD MAINTENANCE-SNOW REMOVAL

The Baker Mfg. Co.

568 Stanford Ave.
Springfield, Ill.

Write for catalogs on
Baker Maney Scrapers ☐
Baker Bulldozers ☐
Baker Road Rooters ☐

Haul Bigger Loads—



with the original trailer built for *Extra Strength without Increased Weight*

CONTRACTORS are hauling larger loads, at lower cost, with the WILLIAMS "Arch-Girder" Trailer.

This modern trailer has set a new standard for Big Capacity in heavy-duty hauling.

Write for Bulletin H.

G. H. WILLIAMS COMPANY
607 Haybarger Lane, Erie, Pa.
Branch Offices: New York, Pittsburgh, Cleveland, Chicago.

WILLIAMS
TRAILER—BUCKETS

CALCIUM CHLORIDE CURING has 6 advantages!

(1) Strengths equal to wet earth curing (Dec., 1929, Highway Research Board Report).

(2) Volume changes satisfactory. There is no more and generally less cracks than with wet dirt curing (Highway Research Board and Bureau of Public Roads Reports).

(3) Surface of Calcium Chloride cured pavements is hard and durable showing even less wear than wet earth cured concrete (Public Roads, Feb., 1930).

(4) New concrete can be opened for light traffic before it gains full strength because Calcium Chloride will continue to cure it though subject to traffic.

(5) It eliminates the risks of wet earth curing such as careful placing of earth, constant sprinkling and competent inspections.

(6) Calcium Chloride, being easily and uniformly spread by one man, saves time and money and insures a uniform cure.

Why not send the coupon for complete data on this improved method of curing?

Calcium Chloride Publicity Committee

Send the coupon to any one of these companies

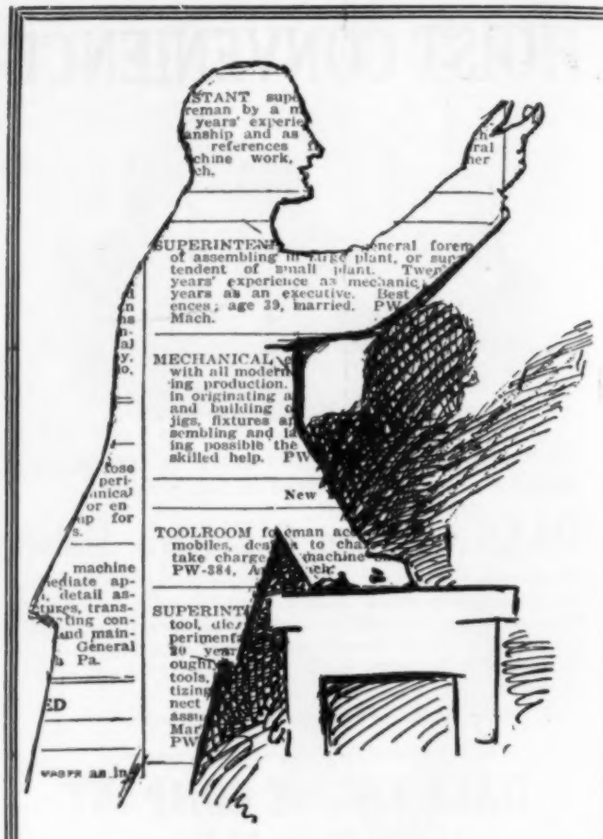
Solvay Sales Corporation, 61 Broadway, N. Y. C.
The Columbia Alkali Company, Barberton, Ohio
The Dow Chemical Company, Midland, Michigan

Please send complete data on Calcium Chloride concrete curing practice.

Name _____

Address _____

C M 8-31



"SEARCHLIGHT" Want ads Talk—

They go direct to those in the industry you wish to reach and tell your story in a forceful and business-like way.

They don't mince words but get right to the point.

Use them for—

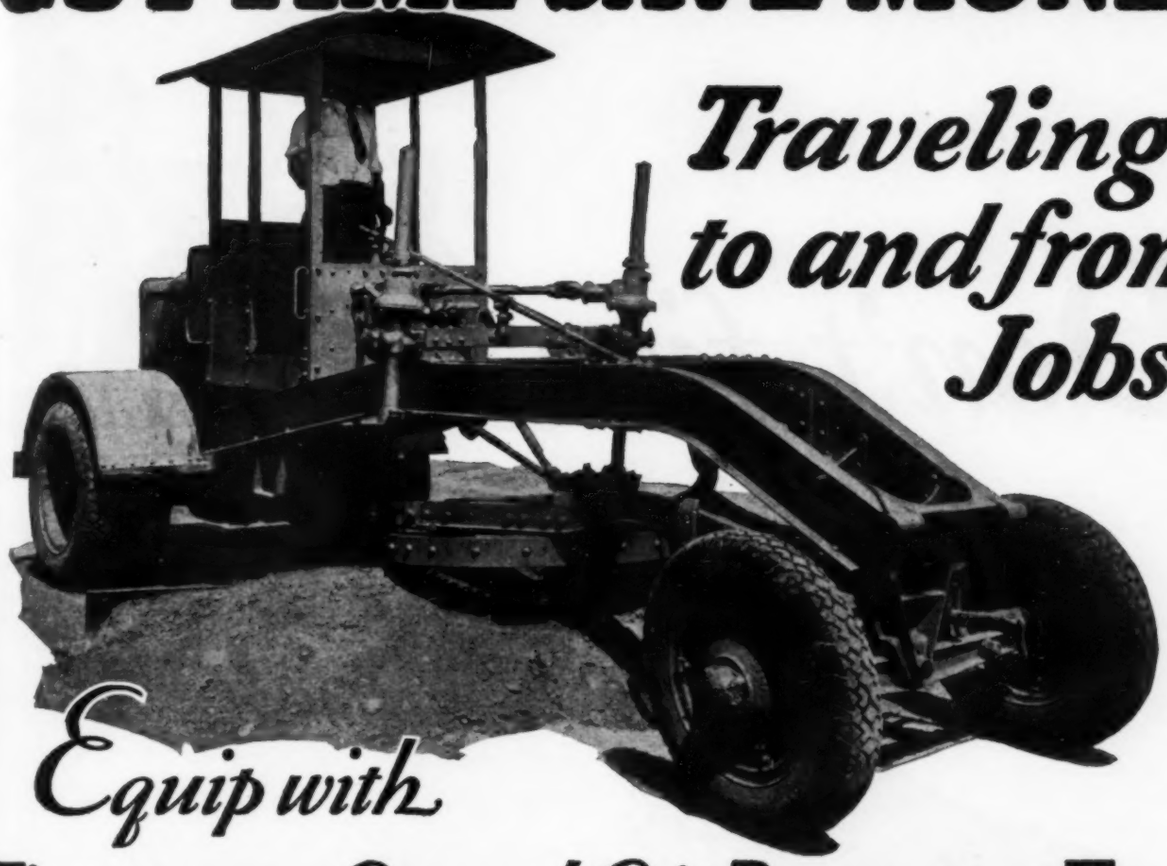
Agencies Wanted	Industrial Sites
Agents Wanted	Labor Bureaus
Auction Notices	Machine Shops
Bids Wanted	New Industries Wanted
Books and Periodicals	Partners Wanted
Buildings For Sale	Patent Attorneys
Business Opportunities	Patents For Sale
Civil Service Opportunities	Plants For Sale
Contracts to be Let	Positions Vacant
Contracts Wanted	Positions Wanted
Desk Room For Rent	Proposals
Desk Room Wanted	Property For Sale
Educational	Receivers' Sales
Employment Agencies	Representatives Wanted
Foreign Business	Salesmen Wanted
For Exchange	Specialties
For Rent	Sub-Contracts Wanted
Franchises	Water Front Property
Help Wanted	Work Wanted

Miscellaneous for Sale, for Rent or Want Ads

For Every Business Want "Think SEARCHLIGHT *First"*

GN-033

CUT TIME-SAVE MONEY



Traveling to and from Jobs

Equip with

Firestone *Ground-Grip* PNEUMATIC TIRES

ARE you losing money because your equipment takes so long getting to and from jobs? Then change over to Firestone Pneumatic Tires! Road graders and tractors *travel faster* on Firestone Pneumatic Tires—add valuable hours to your working time.

More than that, you'll find Firestone Pneumatic Tires give maximum traction in any weather and any kind of going. They cut down your repair bills, because Firestone Pneumatic Tires cushion your equipment and eliminate costly wear and tear.

See your Firestone Dealer today. When purchasing new equipment, specify Firestone Pneumatic Tires, Firestone Puncture-Proof Tubes and Firestone Rims.

Firestone

GROUND GRIP PNEUMATICS

TIRES · TUBES · BATTERIES · RIMS · BRAKE LINING · ACCESSORIES

Copyright, 1931, The Firestone Tire & Rubber Co.

Don't fire

McGRAW-HILL

McGRAW-HILL PUBLISHING CO., Inc., New York · Chicago · Philadelphia · Washington

Business men, industrialists and engineers—600,000 of them—regularly read the McGraw-Hill Publications. More than 3,000,000 use McGraw-Hill books and magazines in their business.

The Business Week
System

Factory and Industrial Management
Maintenance Engineering

American Machinist
Product Engineering

Engineering News-Record
Construction Methods

until you see the whites of their eyes

When business is going full blast, when sales-promotion ammunition is plentiful, a stray shot here and there may, perhaps, be excused. But when the powder supply must be used sparingly, when every shot must hit its target, then it's time for business to heed that famous battle cry: "Don't fire until you see the whites of their eyes."

Today that time has come. Today there must be no shooting at random. Your advertising must aim at business *through the publications that reach your prospects exclusively.*

If you're selling to business or industry, McGraw-Hill publications are the ones to use. The character of their editorial content and the work of their circulation staffs have singled out, for your benefit, over half-a-million business men, industrialists and engineers — the men at whom you're aiming. In a recent check-up 69% of these executives stated that they look to their business papers for information to guide their buying.

We've lined them up for you, made it easy and economical for you to get at them. It's your move.

***1 Jobs that business paper advertising can do NOW**

Here's one of ten ways in which business paper advertising can help your salesmen to get orders . . . right now.

**It can put your sales story before buyers, all over the country, frequently and cheaply.*

This, and the other uses of business paper advertising are explained in our book, "Industrial Advertising at Work." Our representative will gladly bring you a copy on request.

PUBLICATIONS

Detroit · St. Louis · Cleveland · Los Angeles · San Francisco · Boston · Greenville · London

Engineering and Mining Journal
Engineering and Mining World
Metal and Mineral Markets
Coal Age

Electric Railway Journal
Bus Transportation
Aviation
Textile World

Electrical World
Electrical Merchandising
Electrical West
Power

Radio Retailing
Electronics
Food Industries
Chemical & Metallurgical Engineering

This Portable "U. S." LIGHT PLANT

for only $119.00 LIST

Illustration to the right shows complete, easily portable unit equipped with flood lights.

HERE'S a new, 350-watt, portable Lighting Plant for construction job use, priced at only $119!

This amazingly low price has been made possible through simple, compact design. It occupies a space only 16" x 16" and is extremely light weight. It is quiet, smooth and generates steady, flickerless current. Constant voltage is maintained under all load conditions. Batteries are not required. Power unit is a high-grade, 4-cycle, air-cooled engine equipped with foot starter. Runs 10 hours on one gallon of gas.

The "U. S." Line includes many other models for all types of service ranging from 350 watts up to 15 kw. Tell us your requirements and we shall be glad to make recommendations.

Write for price list and catalog

United States Motors Corp.
130 Nebraska St. Oshkosh, Wis.

United States Motors Corp.
Oshkosh, Wis.

Gentlemen: Please send complete information on your portable Lighting plants for construction work.

Name .....

Address .....

City ..... State .....

Cutting 12" Oak Piling 8" Below the surface with

Air Driven

The **Timber Wolf**
Portable Sawing Machine

The Greiling Engineering Co., at Frankfort, Michigan, used the Timber Wolf in cutting piling 8 in. and 20 ft. below the surface. Here operators are supported on timber framed either side of piles. The compressed air drive is supplied for cutting timber under water, to any depth in which divers can operate steadily and with great savings in labor. A.C. and D.C. electric or air driven. Write for details.

REED-PRENTICE CORP.
Worcester, Mass. *Agents in Principal Cities*

TENTS & TARPAULINS

"FULTON QUALITY" Tents and Tarpaulins can be depended upon to protect your workmen and equipment from all kinds of weather conditions.

"FULTEX" Tents, Tarpaulins —**"SHUREDRY"** Tarpaulins, Windbreaks —**"USAMP"** and **"DFMP"** Commercially Mildew-proof Tents—Roll Duck, Burlap Covers and Burlap in Bales.

Write our nearest plant for samples and prices.

Shuredry

Fultex

Fulton Bag & Cotton Mills
Manufacturers Since 1870

Atlanta · New Orleans · St. Louis
Dallas · Minneapolis · Kansas City, Kan.

How

WEMLINGER SERVICE
Helps The Contractor

A NATION WIDE SERVICE
WEMLINGER
STEEL SHEET-PILING

Main Office
NEW YORK, N. Y.
149 Broadway

CHICAGO, ILL.
228 N. La Salle St.

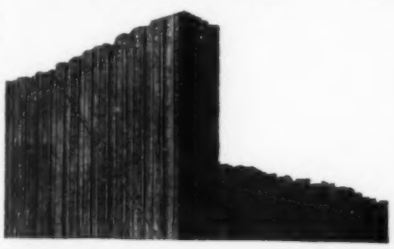
IT'S one thing to know you need a pivoted pile driver for a circular cofferdam—another to have one specially designed for you. This is what WEMLINGER did not long ago for a Contractor, working out all details. This is typical of WEMLINGER SERVICE—practical cooperation based on 25 years' experience and of real dollars-and-cents value to contractors. Why not use it?

STEEL SHEET PILING, NEW, USED
—RENTED, LEASED, BOUGHT, SOLD

BOSTON, MASS. 31 State St.
PHILADELPHIA, PA. Commercial Trust Bldg.
RICHMOND, VA. 1708-1722 Lewis St.
NEW ORLEANS, LA. 711 Queens & Crescent Bldg.
TAMPA, FLA. 315 Tampa St.
LOS ANGELES, CALIF. 2044 Santa Fe Ave.

Chicago Phone
RANdolph 8787

STEEL SHEET PILING
NEW AND USED



SOLD BOUGHT — Stocks at principal points throughout the country for quick shipment — RENTED REPURCHASED

HYMAN-MICHAELS COMPANY

ST. LOUIS
Phone: Chestnut 7470

CHICAGO
20 N. Wacker Drive

NEW YORK
Pennsylvania 6-5645

HOUSTON · LOS ANGELES · SAN FRANCISCO · SEATTLE

Is YOUR JOB *standing still?*

ARE YOU still on the same job—still giving the major part of every dollar you earn to someone else? But here's the way out—a business opportunity for anyone interested in the Construction Field to earn upwards of $5000 to $10,000 a year and to be your own boss, keeping every dollar earned all for yourself. A small capital, plus a "Go-Getter's" nature will start you on this road to quick profits. Get the details.

▶ BOX 112 · LORAIN, OHIO ◀

STEEL PILING

MOST ECONOMICAL SECTIONS ROLLED

1 RENTAL—On this basis, Foster furnishes piling for temporary use for any period of time. Agreement accommodates lessor's requirements and encourages this economical method of securing piling. No deposit required. Rental figures are surprisingly low.

2 SALE WITH RE-PURCHASE AGREEMENT—This agreement offers you the privilege of purchasing piling with an option to dispose of it at an agreed figure when the purpose for which you bought piling is fulfilled. Foster simply agrees, at the time you buy piling from him, to re-purchase that piling from you at a future date, if you wish to sell it.

3 OUTRIGHT SALE—Foster offers new piling for immediate shipment on outright sale, when desired. Where used piling may be employed to advantage on permanent work, Foster is able to supply requirements at prices that stimulate buyers' preference. The purchase of Foster's guaranteed used piling, therefore, makes it possible for many to effect tremendous savings in piling work.

GUARANTEE—Every length of piling leased, bought on sale with re-purchase agreement, or bought outright from Foster is subject to your approval at destination; should your inspection disclose a single unsatisfactory length, replacement will be made at our expense.

Any Quantity Suitable Lengths
Prompt Shipment from Convenient Points

All piling sections furnished by Foster have the universal interlock of three line contact shown.

Interlocks afford water-tightness, and strength, and ample clearance for free driving and pulling.

Phone, Write, or Wire for Foster Quotations

L. B. FOSTER COMPANY
NEW YORK · PITTSBURGH · CHICAGO
Warehouses: Jersey City, N. J. · Carnegie, Pa. · Baltimore, Md. · Chicago, Ill.

POSITION WANTED

YOUNG man (24), structural engineering student, who is ambitious, willing worker, energetic, with a knowledge of form work and heavy lumber construction, etc., wants to take active part in construction work. PW-100, Construction Methods, 501 Guardian Bldg., Cleveland, Ohio.

-0

VERLOOK MACHINERY SALES

offers a complete line of used, rebuilt, reconditioned shovels and cranes at bargain prices. Ask for details on make and size interested in.

VERLOOK MACHINERY SALES
2502-1 East Erie Avenue, Lorain, Ohio

"SEARCHLIGHT" RATES
Construction Methods

UNDISPLAYED:

Positions Wanted—5 cents a word, minimum charge—$1.00 an insertion.

Positions Vacant and other classifications—10 cents a word, minimum charge $2.00 an insertion. Allow 10 words for box address. No additional charge for forwarding replies.

Discount of 10% for payment in advance on 4 consecutive insertions of undisplayed advertisements.

Proposals—40 cents a line.

DISPLAYED:

Space is sold by the "inch," with 30 inches to a page. An "inch" measures approximately 1 inch high by 2¼ inches wide. Rates are from $7.50 to $5.00 an inch, depending on the total space used.

C.M.

REBUILT BARBER-GREENE DITCHERS

1—18 in.x5 ft. 6 in., No. 44B, 35 hp. KTU Buda Engine $2400
1—24 in.x7 ft., No. 44C, 51 hp. YBUI Buda Engine. 4200
1—12 in.x5 ft. 6 in., No. 44C, 51 hp. YBUI Buda Engine, Stoodite Bucket Barrels, Gasoline Barrel, and Pomona Air Cleaner..... 5000

Above taken at random from 13 factory rebuilt Barber-Greene Ditchers now available. All subject to prior sale.

B. E. LINDSTROM
9 S. Clinton St., Chicago, Illinois

Watch the
SEARCHLIGHT SECTION
for Equipment-Opportunities

G-3A

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"DOMESTIC" R-80 and R-125 ROAD PUMP

The pumps described here conform to specifications approved by the Board of Directors of the Associated General Contractors of America.

"DOMESTIC" ROAD PUMPS

R-80 Unit: 80 G.P.M. @ 500 lbs. pressure; 100 G.P.M. @ 400 lbs. pressure

R-125 Unit: 125 G.P.M. @ 320 lbs. pressure; 104 G.P.M. @ 386 lbs. pressure

Domestic" ROAD PUMPS are *the pumps* having the ABRASION RESISTING CYLINDER LINERS and AUTOMATIC, HYDRAULICALLY ADJUSTING PACKING.

Write us today for descriptive bulletin

DOMESTIC ENGINE & PUMP CO., Shippensburg, Penna.

SAFETY IN UNDERPINNING

Is assured by use of

WATSON-STILLMAN

Independent Pump Hydraulic Jacks

Accurate—Dependable—Easy to Repair

These Jacks are being used extensively by Underpinning and Foundation Contractors for underpinning work, sinking piles under foundations and making tests of footings.

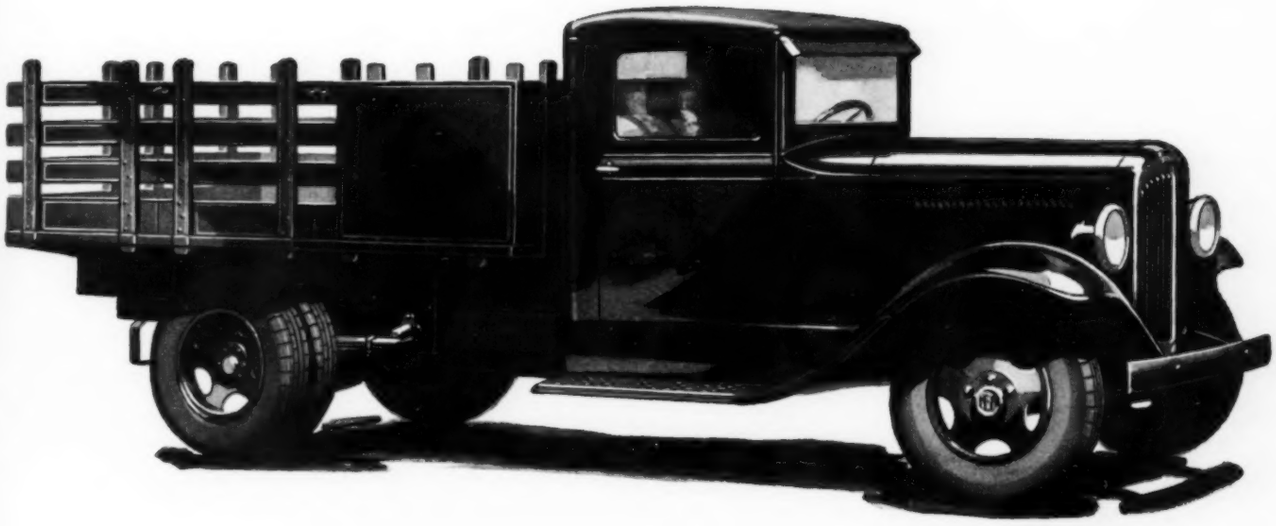
We make a full line of other types of jacks and also many hydraulic devices suitable to the contractor's needs, such as concrete testing presses, benders, shears, pumps, punches, valves, tunneling shields, etc.

Write for Catalogs.

THE WATSON-STILLMAN CO.
114 Aldene Rd.
ROSELLE, N. J.

$625 for REO Quality REO Speed REO Economy REO Long Life

Four-Cylinder $625, Six-Cylinder $725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA



THE new Reo SPEED WAGON sweeps aside all previous work-limitations of trucks in the lowest price class. It fulfills *entirely* the exacting 1½-ton haulage demands of *every* industry.

REO has met the low-price 1½-ton market with the finest truck that sound engineering, extensive factory facilities and ample capital have yet been able to produce. *For comparable quality, size and specifications the new SPEED WAGON is the lowest priced 1½-ton truck in the world!*

THE NEW 1½ TON

REO MOTOR CAR COMPANY, LANSING—TORONTO

REO SPEED WAGON

Extra Size, Extra Strength, Extra Power, with assured lower per-mile cost of operation

4 cylinder engine—5 bearings • 6 cylinder engine—7 bearings • Chrome nickel iron cylinders • Extra large piston displacements • Force feed lubrication Strong channeled frame—7" deep • Four Speed Transmission • Full floating rear axle • Forged Spoksteel Wheels • Internal hydraulic brakes

Two liberal wheelbase lengths
More loading space behind cab.

AVAILABLE WITH STANDARD AND SPECIAL BODIES FOR EVERY HAULAGE NEED

DETROIT PUBLIC LIBRARY
DETROIT
MICH

Confidence!

To the credit of the Link-Belt Shovel-Crane-Dragline let it be said that users have confidence in its builder and its performance—confidence that has been earned through the years, in all kinds of work.

Link-Belt has merited this confidence because of its policy of always giving more, not less than we promise.

Here is a case in point. The Torson Construction Company have purchased ten Link-Belt machines since 1924. They have used them on all kinds of work, all over the country. Illustrated here is one of their five Link-Belt draglines on the Southwestern Outfall Sewer job at Louisville, Ky.

The good-all-the-way-through quality of Link-Belt Shovels-Cranes-Draglines makes friends that "stick". Charles M. Torson is one who says that the Link-Belt is the only machine he would ever buy. Link-Belt users usually repeat. That is "confidence".

4350

LINK-BELT COMPANY
300 W. Pershing Road, Chicago
Offices and Distributors in All Principal Cities

LINK-BELT SHOVELS—CRANES—DRAGLINES